The relationship between gross motor skills, psychosocial adjustment, and peer victimization in school-aged children

by

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Abstract

The aim of this study was to investigate the relationships between childrens' motor competence, psychosocial adjustment, peer victimization, physical activity participation and obesity. Child participants (n = 51; children ages 7 to 10 years) completed self-report measures on peer victimization, loneliness, depression symptoms and anxiety symptoms and also completed the Test of Gross Motor Development-3. Parent participants completed a sociodemographic questionnaire and another on their child's participation in physical activity. For boys, Pearson product-moment correlations revealed that lower motor competence was significantly related to depressive symptoms, social phobia, separation anxiety symptoms, loneliness and peer victimization. For girls, lower motor competence was significantly related to separation anxiety symptoms and loneliness. No correlations were found between motor competence, weight status and physical activity participation. Considering the importance of motor competence on psychosocial development, early motor-based skills training and identification of impairments is crucial for long-term psychosocial wellbeing.

Keywords

Motor Skills, Motor Competence, Test of Gross Motor Development, Psychosocial Adjustment, Anxiety, Depression, Peer Victimization, Bullying.

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CHAPTER 1: INTRODUCTION

Motor competence, used interchangeably with motor (skill) performance or motor (skill) proficiency is defined as "a person's movement coordination quality when performing different motor skills, ranging on a continuum from gross to fine motor skills" (D'Hondt, Deforche, De Bourdeaudhuij & Lenoir, 2009). Motor skills are considered the building blocks for future more complex skills (Clark & Metcalfe, 2002; Gallahue & Ozmun, 2006) and are supported from genetically determined traits that are motor abilities (Edwards, 2010). Mastery of gross motor skills is essential to the developing child. During early development, most children will acquire a very basic repertoire of movement; however, improvement and mastery is dependent on continuous practice, encouragement, feedback and instruction (Gallahue & Ozmun, 2006). Mastering motor skills is an important correlate to many health-related behaviours and outcomes such as physical activity involvement, higher cardiorespiratory fitness, and healthier weight status (Lubans, Morgan, Cliff, Barnett, & Okely, 2010).

Motor coordination is a spectrum of human functioning and it is, like any other human behaviour, normally distributed within the population. While most people cluster around average, a small percentage of individuals are extremely coordinated and correspondingly, uncoordinated. Children with severe motor impairments, or those in the fifth percentile, are described as having developmental coordination disorder; also known as DCD. DCD is a neurodevelopmental disorder broadly defined as a marked impairment in the development of motor coordination (APA, 2013). There is now strong evidence to suggest that these children are less physically active (Cairney et al. 2005b) and more overweight and obese than their more motor competent peers (Cairney, Hay,

Faught, & Hawes, 2005a; Cairney et al. 2010a). They also experience more social isolation (Smyth & Anderson, 2000), peer victimization and peer rejection (Livesey, Lum Mow, Toshack, & Zheng, 2011; Campbell, Missiuna, & Vaillancourt, 2012), thus having lower levels of self-worth (Piek, Baynam & Barrett, 2006) and self-esteem (Miyahara & Piek, 2006), and higher levels of anxiety and depression (Campbell et al. 2012; Francis & Piek, 2003; Lingam et al. 2012; Skinner & Piek, 2001). Many of these problems are oftentimes more serious than the motor impairments themselves (Cairney, Rigoli, & Piek, 2013). For example, depressive and anxiety disorders are two of the most prevalent mental health problems in children and adolescents in the world (Chisholm et al. 2016). A recent meta-analytic review was performed to calculate the new prevalence rates of mental health disorders in youth worldwide. Results yielded prevalence rates at 6.5% for anxiety and 2.6% for depression (Polanczyk, Salum, Sugaya, Caye, & Rohde, 2015) and both are very likely to persist into adulthood (Reef, Diamantopoulou, Van Meurs, Verhulst, & Van Der Ende, 2009). Preventing these disorders is now considered a public health priority (WHO, 2008) and identifying them in the early developmental stages should be part of every country's agenda (Herrman, 2014). If motor skills contribute to the etiology of these disorders, prevention efforts can be linked to motor skills training for children with developmental coordination disorders.

According to the most commonly reported prevalence rates, 5-6% of children meet the diagnostic criteria for DCD (APA, 2013); that is approximately 215,000 of Canadian children (Statistics Canada, 2016). In addition, children between the fifteenth and fifth percentile are considered to have borderline motor impairment (Henderson & Sugden, 1992). There is a growing body of literature on the problems that children with

DCD face, however, because most of the research is limited to clinical populations or those who are "suspect for DCD", it begs the question about children that do not necessarily meet clinical cut point criteria; (1) Is there a population of children being missed in the treatment of children with DCD facing psychosocial adjustment problems? and (2) Do children along the full spectrum of motor skills experience psychosocial problems more as they move down the continuum of motor ability and less as they move up? Furthermore, very few studies have focused on the different constructs believed to interact with poor motor skills and psychosocial adjustment problems. Research has suggested that peer problems are oftentimes experienced in parallel with poor motor competence (Wagner, Bös, Jascenoka, Jekauc, & Petermann 2012). In reality, most of the activities that children engage in, involve active play (playing on play structures, running, or handling a ball) and to engage in these activities successfully, a certain level of motor competence is required (Morrison et al. 2012). Children with low motor competence may be fearful of failure or peer criticism (Ekornas, Lundervold, Tjus, & Heimann, 2010) resulting in different types of social problems, such as withdrawal, isolation, and loneliness. Additionally, gross motor skills are developed through games and play with other children (Emck, Bosscher, Beek, & Doreleijers, 2009), which imply that low motor competent children are at greater risk of further compromising their skills. This type of withdrawal from physical activities contributes to overweight and obesity, which is another important consequence that must be considered in the study of motor competence and psychosocial adjustment problems.

A better understanding of the ways that motor skills affect psychosocial adjustment is necessary so that families, schools, and health care professionals are more equipped to handle these problems as they arise. Motor skills should be thoroughly understood and supported to ensure that children receive the resources necessary to participate in motor activities throughout the life span. More research will help with intervention strategies and program development directly related to the psychosocial adjustment problems that are thought to be a product of low motor competence. The current study aims to examine the relationships between motor competence and psychosocial adjustment problems (loneliness, anxiety and depression symptoms) as well as self-reported peer victimization, physical activity and obesity in a normally developing, sub-clinical sample (related to DCD) of school-aged children.

This introduction will describe the theoretical model used in this study, followed by an overview of conceptual definitions, a review of pertinent literature and the study hypotheses.

Theoretical Model

This thesis is based on the theoretical framework first coined by Cairney, Veldhuizen and Szatmari (2010) and later elaborated by Cairney et al. (2013) as the Elaborated Environmental Stress Hypothesis. This hypothesis is based on Pearlin's (1989, 1981) work in the field of stress and his stress process model. The Environmental Stress Hypothesis highlights the complexity that is the pathway between motor competence and psychosocial adjustment. It is suggested as a likely explanation for why children with DCD face more psychosocial adjustment problems than their more motor

competent peers. The model emphasizes that if a person is exposed to one serious stressor, it is not often that it will occur alone. With the understanding that most activities children engage in require a certain level of motor competence, a child unable to conceal their deficiency will experience a certain level of stress directly related to this. This stress would be described as the primary stressor and would result in a number of other stressors to evolve from it. For example, a child with motor skill impairments and a high BMI in a physical education class could quite possibly feel short of breath and/or experience criticism from others and/or be excluded in certain games. In other words, clusters of stressors develop because one primary stressor will lead to another and to yet another. Pearlin explains that "if we fail to discern all the appreciable stressors that are contemporaneous, we also will fail to interpret correctly the outcomes that we observe" (1989; p. 248). If this were put in practice, measuring potential stressors related to poor motor coordination is important in understanding its relationship with psychosocial adjustment problems such as anxiety, depression and loneliness.

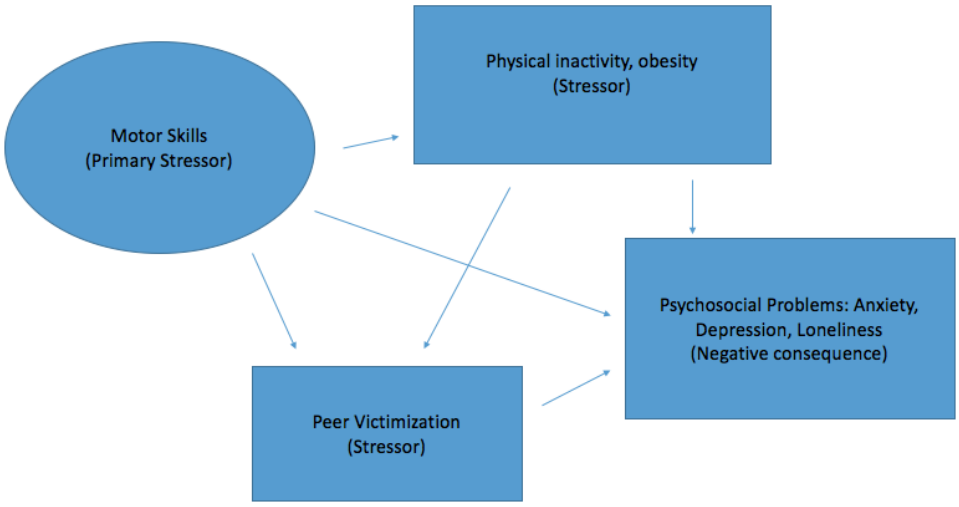

Figure 1. *Modified version by Cairney, Rigoli & Piek (2011): The Elaborated Environmental Stress Hypothesis*

In the current study, we chose to include two stressors that have been suggested to occur as a result of low motor competence. We identified peer victimization as a potential stressor due to the value placed on skilfulness in Western society (Shoemaker & Kalverboer, 1994). Research shows that low motor competent children experience more peer victimization than their more motor competent peers (Campbell et al. 2012) and are less preferred by their peers in both play and classroom settings (Livesey et al. 2011).

Furthermore, we identified obesity as a potential stressor due to its predominance amongst low motor competent children. Poor motor coordination limits a child's ability to engage in physical activity and active play (Rivilis et al. 2011), which results in higher weight status (Hendrix, Prins, & Dekkers, 2014). Research is robust in highlighting that physical inactivity and obesity are prevalent in low motor competent children (Cairney et al. 2005a; Cairney et al. 2005b; Cantell, Crawford & Tish Doyle-Baker, 2008; Lifshitz et al. 2014) and thus, may act as potential stressors, not to mention, the interplay between the two. Children with a higher weight status are more likely to be victimized by their peers (Bacchini et al. 2017), contributing even further to our hypothesis that these are two prevalent stressors in low motor competent children.

Both of these potential stressors are known to cause some types of psychosocial adjustment problems. For example, a meta-analytic review by Hawker and Boulton (2000) outlined the important relationship between peer victimization or "bullying" on psychosocial adjustment. Children who are regularly victimized are known to experience more depression, anxiety, and loneliness than their non-victimized peers and children who are overweight or obese are not only more likely to be victimized (Pearce, Boergers

& Prinstein, 2002) but are also more likely to be psychosocially maladjusted (Sweeting, Wright & Minnis, 2005).

Figure 1 is a modified version of Cairney et al. (2013) figure to highlight how the experience of poor motor coordination can trigger other stressors and result in the negative consequence of depression, anxiety and loneliness.

Conceptual Definitions

Motor Skills

The term '**motor**' refers to the 'underlying biological and mechanical factors that influence movement' (Gabbard, 2008, p.6). It is a term used interchangeably with 'movement' and is usually followed by a number of different words used to describe the large scope of motor concepts. By virtue of understanding that 'development' is the changes in an individual's functional capacity, **motor development** is defined as a 'sequential, continuous age-related process whereby movement behaviour changes' (Haywood & Getchell, 2005, p.5). Motor development occurs from a human's conception until their last stage of life. It results from the interaction of biological characteristics (e.g. maturation, heredity), and environmental influences (e.g. home, school, culture, social influences) (Gabbard, 2008).

Motor learning is when a child learns a new skill that is not related to age but instead to an environmental circumstance, such as changing a child's hand position on a basketball during a free throw (Haywood & Getchell, 2005)**.** The term **motor behaviour** is used when referring to both motor development and motor learning, because it is the changes from both biological and environmental factors (Haywood & Getchell, 2005).

Motor behaviour becomes a product of what learning and performance produces, a motor skill. This is where the **fundamental motor** (or movement) **skill** (FMS) comes to life. Basic movement patterns that involve two or more body segments simultaneously are what make the FMS (Gallahue & Cleland Donnelly, 2003). There are several of these patterns, namely running, walking, writing, and kicking. They are classified differently amongst the literature but are always broken down similarly. Gabbard (2008) classifies them into three groups. First, locomotor skills involve moving oneself through space. These include running, hopping, jumping, skipping, galloping, sliding, and leaping. Second, non-locomotor skills, namely stability and balance, are defined as the "ability to maintain equilibrium in relation to the force of gravity" (Gabbard, 2008, p. 190). Third, manipulative skills (or object control skills) require the manipulation of tangible objects using the hands and feet. These include throwing, catching, bouncing, kicking, writing, buttoning and drawing. Within these categories, FMS are dichotomized into gross and fine motor skills. **Gross motor skills** refer to the FMS that involve large muscle groups that create large movement patterns, such as running and throwing (Craig, 1996) whereas **fine motor skills** are FMS that involve the use of small muscle groups that create small movement patterns such as writing and tying (Payne & Isaacs, 2008).

Motor skills are also heavily dependent on **visual** and **perceptual motor skills** (Haywood & Getchell, 2005). These are defined as "the degree to which visual perception and finger-hand movements are well coordinated" (Beery, 1997, p.19). Other terms frequently used in the literature are **motor control**, referring to the study of movement processes and how movements are controlled (Gabbard, 2008) and **motor competence**, a product of a person's motor behaviour, referring to the proficiency of

someone's motor skills (Logan, Robinson, Rudisill, Wadsworth, & Morera, 2014). A person's motor competence can be identified on a spectrum of high, average, or low. According to Edwards (2010), individuals differ largely on their ability to learn and perform motor skills because of their genetically determined **motor abilities.** It is understood that everyone is born with the same motor abilities but these differ in strength. The strength of these motor abilities falls within a normal distribution in the population. The largest number of individuals falls on or near the norm and then increase or decrease as those abilities draw further away from that norm.

While it is true that children fit different motor competence classifications, motor development is only taken into consideration when dysfunctions or poor movement behaviours appear (Davies, 2003). Developmental coordination disorder (DCD) is a neurodevelopment disorder that is characterized by levels of coordinated motor skills that are severely below that expected given the child's age and opportunity for skill learning and use (APA, 2013). Poor motor coordination can also be described as clumsy, slow or inaccurate motor skills (Lifshitz et al. 2014). The most commonly reported prevalence rates of DCD in school-aged children are 5-6% (APA, 2013).

Various instruments exist to assess fundamental motor skill performance. These instruments are either process- or product-oriented (Gabbard, 2008). Process-oriented assessments focus on the sequence or continuum of the motor skill whereas a product-oriented assessment is based on the outcome of the motor skill, such as time, distance, or successful attempts (Burton & Miller, 1998). For example, a process-oriented assessment on running will look at stride length, foot/arm placement and center of gravity whereas a product-oriented assessment will measure a child's speed over a certain distance

(Gabbard, 2008). Each instrument has distinctive criteria and procedures but share a common goal, that is, to measure a child's motor competence.

Physical Activity

Physical activity is defined as "any bodily movement produced by skeletal muscle that results in energy expenditure above resting levels" (Caspersen, Powell & Christensen, 1985, p.126). The World Health Organization recommend that children and youth ages 5 to 17 accumulate at least 60 minutes of moderate to vigorous intensity physical activity per day (2010). The new Canadian guidelines, published afterward, were concordant with these (Tremblay et al. 2011).

Given the thousands of articles documenting the positive relationship between physical activity and health outcomes, it is exceptionally important to determine the amount of physical activity individuals participate in. According to Loprinzi and Cardinal (2011), an accurate and reliable measure of physical activity and sedentary behaviour will help community leaders and researchers better understand four key things: (1) the association between these behaviours on health outcomes, (2) the dose of physical activity required to elicit favorable health outcomes, (3) determinants of physical activity and sedentary behaviour, and (4) the impact of physical activity and sedentary-reducing interventions on the prevalence of overweight and obesity in children.

Unfortunately, measuring physical activity amongst children is challenging due to the high degree of variability in their movement patterns. Children's physical activity patterns are often sporadic and intermittent (Stookey, Mealey & Shaughnessy, 2011). A wide variety of tools exist to assess the physical activity behaviours of children. Loprinzi

and Cardinal (2011) reviewed the measurement tools typically used to assess children's physical activity. Objective measurements include: (1) monitoring devices (e.g. accelerometers, pedometers), (2) measures of physiological responses (e.g. heart rate monitors) and (3) direct observation, while the most common are subjective measures which include self-reports and proxy report measures from parents or teachers (e.g. questionnaires).

Objective monitoring tools such as accelerometers that record acceleration during movement, pedometers that record step counts and heart rate monitors that track beats per minute are frequently used to assess physical activity. Although these measurement tools are good predictions of physical activity, they come with a number of limitations. Heart rate monitors are small devices worn around the chest with a strap and track the participant's heart rate during the observation period. They are inexpensive and unobtrusive (Loprinzi & Cardinal, 2011), making them a viable choice for researchers. A large disadvantage is the weak relationship between heart rate and energy expenditure (Loprinzi & Cardinal, 2011) because other factors affect heart rate such as stress and temperature changes (Fulton et al. 2001). Accelerometers are small devices worn around the waist on an adjustable belt that record the frequency and magnitude of the body's acceleration during movement (Loprinzi & Cardinal, 2011). Whilst they are unobtrusive and known to be the better method for assessing movement they remain expensive and fail to measure all modes of activity such as biking and swimming (Kang, Mahar, & Morrow, 2016). Pedometers are usually the alternative to the previous monitoring devices. They are small devices that come in many forms and measure the number of steps taken over a given time. The drawbacks to pedometers are, like accelerometers,

their insensitivity to specific types of physical activity as well as their inability to differentiate between vigorous, moderate and light activity levels (Kang et al. 2016). The latter is especially important considering the recommended guidelines of 60 minutes of moderate to vigorous physical activity per day. Direct observation is yet another objective measure by which trained observers record children's physical activity in real time or on a recording over a given time period (Kohl, Fulton & Caspersen, 2000). The nature of this measurement is advantageous because it can provide information that other devices cannot, such as the type, context and intensity of the physical activity (Loprinzi & Cardinal, 2011). Unfortunately, direct observation is very time consuming, is limited to certain environmental contexts (Kang et al. 2016) and has a relatively high cost per participant (Kohl et al. 2000).

Alternatively, subjective measures such as self and proxy reports are another suitable way to capture a child's physical activity. Self-report measures ask that a child recall their physical activity involvement either by interview, questionnaire, diary or log. They are easy to administer, relatively inexpensive and provide a variety of physical activity information (Loprinzi & Cardinal, 2011) making it often the measure of choice, especially in large samples. Because self-report measures are unreliable in younger children, proxy reports by which parents or teachers report the child's physical activity behaviours are the alternative. The challenges with self and proxy-report measures include interpretation problems and the accuracy of recall (Kohl et al. 2000). Despite these limitations, a study performed by Janz, Broffitt and Levy (2005) found that their proxy-report measure had moderate to good reliability and some support for validity. Furthermore, Sallis and Saelens (2000) performed a literature review of seventeen

instruments for assessing physical activity and found that the reported reliabilities were acceptable and all measures showed some evidence of validity.

Weight Status

Although weight varies widely in childhood (Craig, 1996), the classification of a child's weight is usually performed using gender and age cut points of the body mass index (BMI, kg/m²) (Strong et al. 2005). BMI is a common measure that compares the ratio of weight-to-height. Once a child's BMI is configured, it is compared to a growth chart depicting whether the child is developing normally for their age. Classifications include: underweight (< 3rd percentile), normal weight (> 3rd and < 85th percentile), overweight (> 85th percentile), obese (> 97th percentile) and severely obese (> 99.9th percentile). In 2006, the World Health Organization published their study on the construction of child growth curves. These charts were adapted for the Canadian population and republished in 2014 by Dietitians of Canada. They indicate the percentile rank a child will fall into within the population. The charts are used in both public health settings and for research purposes to monitor, assess, and better understand children's growth patterns.

Psychosocial Development

Psychosocial development refers to the psychological and social factors that influence growth (Craig, 1996) and can be thought of as the interaction between a person's psychological development and their social environment. It involves changes in personality and interpersonal skills related to self-concept, emotions, social skills and

behaviours (Craig, 1996). Developmental psychologists have come to propose a number of theories addressing the ways in which children come to develop and interact with their environments. One of the more influential theories on psychosocial development was introduced by Erik Erikson (1950, 1968, 1972, 1980). Erikson describes eight stages of psychosocial development from infancy to adulthood. If a stage is surmounted, a psychosocial strength can be gained whereas failure to successfully surmount a stage leads the individual into the next stage psychologically unprepared. Optimal psychological health is gained if every stage is surmounted successfully. For example, the first stage, which occurs in infancy, is trust versus mistrust. Infants learn to trust their caregivers to provide their basic needs. The crisis in this stage would occur if the infant were mistreated leading to the development of mistrust. The psychosocial strength that is learned is hope.

Belsky, Steinberg, & Draper (1991) put forward the theory of socialization and interpersonal development to explain that rearing experiences in early childhood shape psychological, behavioural and somatic development. For example, positive and supportive parental influences will lead to more trustworthiness of others and deeper, enduring interpersonal relationships, whereas stress, rejection, and inconsistent rearing will lead to mistrust and insecure attachments. The latter experience will often predict behaviour problems into adolescence such as overt aggression, noncompliance, depression and anxiety (Belsky et al. 1991). Evidently, the susceptibility of children to rearing experiences is different due to genetic factors, which is explained further in Belsky's later work (2005).

These theoretical models can be useful frameworks to understand the way environmental and genetic factors influence a child's psychosocial development. As previously mentioned, if a child is emotionally unprepared for a particular life stage, they will be disadvantaged psychologically and socially. This type of emotional instability can also be expressed by the development of internalizing problems. The use of internalizing problems is often interchanged with psychosocial maladjustment and/or psychosocial adjustment problems. Internalizing problems are characterized by "high levels of emotionality, especially anxiety and depression, as well as increased withdrawal and avoidance" (Ştefan & Avram, 2017). Children who manifest internalizing problems have a risk of developing negative outcomes such as loneliness, withdrawal, and heightened anxiety and depression (Rubin, Coplan, & Bowker, 2009). This thesis focuses on specific psychosocial problems that will be explored in more detail in the following paragraph.

Epidemiological surveys in Canada show that 14% of children aged 4 to 17 experience clinically important mental disorders at any given time (Waddell, Offord, Shepherd, Hua, & McEwan, 2002). Anxiety is a "feeling of uneasiness, apprehension, or fear that has a vague or unknown source" (Craig, 1996, p. 296). Anxiety disorders include unwanted reactions to certain stimuli that can be extreme and are, most often than not, unwanted. They include, but are not limited to, generalized anxiety, separation anxiety, social phobia, and obsessive-compulsive disorder (Smetanin et al. 2011). When it is excessive, inappropriate, persistent and not restricted to particular circumstances, it is generalized anxiety disorder (GAD; Stolerman, 2010). However, they can be very specific. For example, separation anxiety (SA) occurs when a child fears strangers or

being separated from their caregiver (Craig, 1996) and social phobia (SP) refers to the anxiety and fear one feels at the idea of "being observed or watched by other people and in particular, where the individual expresses distress when undertaking certain activities in the presence of others" (Mattick & Clark, 1997, p. 457). Other anxiety disorders include panic disorder (PD), characterized by "recurrent unexpected panic attacks followed by at least 1 month of persistent concerns about additional attacks (i.e., anticipatory anxiety), worry about the implications or consequences of the panic attack or significant changes in behavior (e.g., avoidance) related to the attacks" (Stolerman, 2010, p. 952) and obsessive-compulsive disorder (OCD), characterized by obsessions and compulsions described as "repetitive, unwanted, intrusive thoughts, images, or impulses" and "repetitive physical or mental acts an individual feels driven to perform in a characteristic, stereotyped way, usually to relieve the anxiety or discomfort associated with depression" respectively (Stolerman, 2010, p. 914). Depressive disorders also exist in children affecting 1-2% of this population (Stolerman, 2010). Depressive disorders in children and adolescents are characterized by a pervasive and abnormal mood state that consists of sadness or irritability and that is severe or persistent enough to interfere with functioning or cause considerable distress (Martin, Volkmar, & Lewis, 2007).

Social functioning is another important factor when considering a child's psychosocial development. The relationships children form with their peers in middle childhood are very important for developing social well-being. Children who are disliked by their peers are known to show signs of loneliness and social dissatisfaction (Cassidy & Asher, 1992) causing other internalizing problems later on (Mushtaq, Shoib, Shah, & Mushtaq, 2014). Loneliness is a very common experience with approximately 80% of

those under 18 years of age report loneliness at some point in their life (Berguno, Leroux, McAinsh, & Shaikh, 2004). Due to the subjectivity of loneliness, no perfect definition exists. Loneliness usually refers to a sense of isolation, the absence of social contact, and the absence of belongingness (Mushtaq et al. 2014).

Peer Victimization

The Center for Disease Control and Prevention (CDC) and the Department of Education (ED) recently released the first uniform definition of peer victimization, or 'bullying':

> Bullying is any unwanted aggressive behaviour(s) by another youth or group of youths who are not siblings or current dating partners that involves an observed or perceived power imbalance and is repeated multiple times or is highly likely to be repeated. Bullying may inflict harm or distress on the targeted youth including physical, psychological, social, or educational harm. (Gladden, Vivolo-Kantor, Hamburger & Lumpkin, 2014, p. 7).

Early studies viewed victimization solely as physical or verbal attacks but a shift in perspective has changed what was thought of victimization to include other types of peer problems such as ignoring, excluding and spreading rumors (Crick & Grotpeter, 1996; Crick & Bigbee, 1998). The following paragraph will expand on the different types of victimization.

Confrontational victimization or direct aggression involves both physical and verbal aggression (Lamb, Pepler & Craig, 2009). Physical victimization is "any form of victimization in which the victim's physical integrity is attacked" and verbal

victimization is when "the victim's status is attacked or threatened with words or vocalizations" (Hawker & Boulton, 2000). Verbal victimization can also be used against someone in an indirect context (through another individual) and can therefore be included under relational victimization. Relational victimization or indirect aggression involves being rejected, excluded, ostracized, or criticized by one's peers (Lamb et al. 2009; Lev-Wiesel, Sarid & Sternberg, 2013). Cyberbullying, a relatively new form of victimization, is carried out by a group or an individual and involves the use of electronic modes of communication such as mobile phones or the internet to intentionally harass, threaten or intimidate someone who cannot easily defend themself (Li, Cross & Smith, 2011; Smith et al. 2008). The different types of victimization examined in the current study were based on the aforementioned definitions.

Peer victimization can be measured using self or proxy reports or peer nominations or peer ratings. In a peer nomination measurement style, students will be asked to name approximately three children in their class they think fit under a list of descriptive questions (e.g. is often teased by other kids, is often pushed around by other kids, is often excluded from games, bullies other kids) (Solberg & Olweus, 2003). Peer ratings are similar in that they include a descriptive question but the student then rates each child from their classroom on a scale. The problem with peer nominations and ratings are that they do not estimate the prevalence or frequency of the bullying and/or victimization (Soldberg & Olweus, 2003). In self and proxy report measures, children, teachers or parents are asked to report on different behavioural questions about their students, or their child's experiences with peer victimization. The response options for this measurement style are typically scaled (e.g. never to everyday), binary (e.g. yes/no,

true/false), open-ended, or multiple choice and, although not always, include a time frame (e.g. within the last 7 days…) (Vivolo-Kantor, Martell, Holland & Westby, 2014).

Literature Review

This review of literature is comprised of the following sections: (a) children's involvement in physical activity, (b) children's weight status, (c) children's peer-related difficulties, in particular, how it relates to low motor competence, (d) the relationships between motor skills, peer victimization and psychosocial adjustment, and (e) conclusion.

Mastering motor skills contributes to children's physical, social and psychological development (Gallahue & Ozmun, 2006) and builds the foundation for an active lifestyle (Lubans et al. 2010). Studies demonstrate that motor skills are a predictor of consequent physical activity participation (Barnett, Van Beurden, Morgan, Brooks, & Beard, 2009; Lopes, Rodrigues, Maia, & Malina, 2011; Lubans et al. 2010; Reillo, Vlahov, Bohren, Leppo, & Davis, 2010) and by way of a feedback loop, motor skills are developed and refined as a result of physical activity (Malina, Bouchard & Bar-Or, 2004).

Not only is physical activity important for motor skill development but it also has a myriad of other health benefits across all stages of life. Strong et al. (2005) performed a systematic review of 850 articles related to the effects of physical activity on health and behaviour outcomes. The review found evidence to support the effects of physical activity on multiple components of cardiovascular health, musculoskeletal health and fitness, adiposity, blood pressure, lipid and lipoprotein levels, academic performance and mental health indicators such as self-concept, anxiety and depression symptoms. Physical activity also reduces the risk of chronic diseases such as cardiovascular disease

risk (Andersen et al. 2006), diabetes (Steinberger & Daniels, 2003), and obesity (Dentro et al. 2014; Kim et al. 2005; Tremblay & Willms, 2003). According to Canadian guidelines, children and youth ages 5 to 17 require at least 60 minutes of moderate to vigorous intensity physical activity per day (Tremblay et al. 2011). It is estimated that only 9% of boys and 4% of girls are meeting the recommended guidelines (Colley et al. 2011). This puts many children, including those with low motor competence not engaging in physical activity, at risk of many negative health outcomes.

Weight status is a critical factor to consider in a child's motor skill development. After the age of 7, a child who is overweight or obese is more likely to continue to be overweight or obese in adulthood (Haywood & Getchell, 2005). In adulthood, the disease outcomes to being overweight or obese include type 2 diabetes, ischaemic and hypertensive heart disease, stroke, osteoarthritis and many types of cancer (Ezzati, Lopez, Rodgers, & Murray, 2004). Overweight and obesity also cause several fitness indices such as endurance, strength, and agility to be compromised (Kim et al. 2005). There exists a large body of literature that documents the negative relationship between body composition and motor skills in all age groups (Hendrix et al. 2014; Khalaj & Amri, 2014; Lopes, Stodden, Bianchi, Maia & Rodrigues, 2012; Morano, Collela & Caroli, 2011; D'Hondt et al. 2009; Okely, Booth & Chey, 2004). Studies demonstrate that low motor competent children participate in less physical activity (Cantell et al. 2008; Cairney et al. 2005b), which may result in overweight and obesity (Cairney et al. 2005a) that increases with age (Hendrix et al. 2014). Also, children who are overweight or obese are less inclined to participate in physical activity (Trost, Sirard, Dowda, Pfeiffer, & Pate, 2003), which may contribute to acquiring less motor experiences and thus being behind

in motor development (Morano et al. 2011). In fact, normal weight children develop gross motor skills much faster than do children with higher BMIs (D'Hondt et al. 2013; D'Hondt et al. 2011). D'Hondt et al. (2009) explains this negative relationship from a mechanical point of view. In their study, movement quality decreased in the groups with higher body mass indices when more body segments were involved. This was because overweight and obesity increases the weight of different body parts that do not contribute to movement, causing a biomechanical movement deficit.

It was suggested that children with low motor competence likely avoid physical activity due to fear of failure and peer criticism (Ekornas et al. 2010). In fact, there is an increasing awareness that motor coordination problems often co-occur with peer-related difficulties (Poulsen, Ziviani, Cuskelly, & Smith, 2007; Livesey et al. 2011; Campbell et al. 2012). A plausible explanation is that children with an easily observable or overt characteristic can provoke an aggressor (Vessey, Duffy, O'Sullivan, & Swanson, 2004). Campbell et al. (2012) compared 159 fifth graders who were categorized with probable DCD to a control group matched on age and gender. Children completed self-report measures on peer victimization and depression. For depression, children in the probable DCD group rated themselves as significantly more depressed than the controls. For victimization, children in the probable DCD group reported more exposure to both verbal and relational victimization than the controls, however no effect was found for physical victimization. On the other hand, Piek, Barrett, Allen, Jones, & Louise (2005) assessed degree and type of peer victimization and global self-worth in 43 children at risk for DCD and 43 controls matched on age and gender. Their study did not show significant differences between both groups for peer victimization or global self-worth. They did,

however, find that peer-victimization impacted the self-worth of girls at risk for DCD but did not have any significant impact on any of the other groups. Bejerot & Humble (2013) performed a retroactive study on adult psychiatric patients diagnosed with either autism spectrum disorder or attention-deficit hyperactivity disorder. Their study found that of those with gross motor skill problems during childhood, 70% had been victimized by peers compared to 47% of those with normal motor competence. Furthermore, Livesey et al. (2011) performed a study on motor performance in both play and classroom settings and found that children with poor motor skills were less liked by their peers. A study that looked at boys with DCD found that they had less sports participation and more loneliness than their non-DCD counterparts (Poulsen et al. 2007). Smyth and Anderson (2000) observed a DCD group (under the 15th percentile on the Movement Assessment Battery for Children [MABC]; Henderson & Sugden, 1992) and a control group (above the 35th percentile) for time spent alone, time spent with other children, time spent in groups of different gender composition, and different types of play (e.g. unstructured, structured, negative social contact). Children in the DCD group were found to spend more time alone, more time watching other children play, more time with only one other child, more time moving without being involved in any type of structured activity. They also confirmed that their DCD group was not in fact involved in any more negative social contact than the control group. This study contradicts the notions that poor motor coordination increases the likelihood of peer victimization although it does provide some evidence that children with poor motor coordination may be lonelier due to exclusion and withdrawal from playground activities. Although the research is somewhat inconclusive, most studies show evidence to support the idea that children with motor coordination

problems are in fact victimized and excluded in peer relations though more research is necessary to solidify the findings. Canadian data collected by the World Health Organization's Health Behaviour in School-aged Children survey revealed that 9% to 19% of girls and 9% to 21% of boys are regularly victimized (Currie et al. 2008). A child can be a target to victimization for many reasons, however it has been suggested that clumsiness, a visible disruption in performance, makes children especially vulnerable (Cairney et al. 2013). Nansel et al. (2001) found that the ability to make friends was negatively associated to being bullied. If low motor competent children are in fact less accepted by their peers, their ability to make friends would undoubtedly be compromised.

The effects of peer victimization can be very serious, especially in terms of psychosocial functioning. Victimized children are more likely to suffer from internalizing problems such as symptoms of depression (Austin & Joseph, 1996), anxiety (Hawker & Boulton, 2000), feelings of loneliness (Boulton & Underwood, 1992; Crick & Bigbee, 1998) and emotional distress (Crick & Bigbee, 1998). Moreover, victimized children are known to have low self-esteem (O'Moore & Kirkham, 2001), spend a lot of time alone (Forero, McLellan, Rissel, & Bauman, 1999), and experience lower levels of happiness (Rigby & Slee, 1992) than their non-victimized counterparts. Researchers have proposed that children exhibiting these emotional problems make them more vulnerable to victimization, and so the more a child is victimized, the more emotional distress they may display, which reinforces being further victimized (Crick & Bigbee, 1998; Olweus, 1993; Troy & Sroufe, 1987).

Children with low motor competence also reportedly exhibit signs of psychosocial adjustment problems. Specifically, low motor competence has been linked to

withdrawal, social isolation and social problems (Chen, Tseng, Hu, & Cermak, 2009; Smyth & Anderson, 2000; Tseng, Howe, Chuang, & Hsieh, 2007; Schoemaker & Kalverboer, 1994), low self-esteem (Miyahara & Piek, 2006), low global self-worth (Skinner & Piek, 2001), less acceptance by peers, less often asked to play with other children, less playmates in general (Schoemaker & Kalverboer, 1994) and less social support (Skinner & Piek, 2001). On top of this, studies show that these children are more victimized by their peers (Campbell et al. 2012) and have increased internalizing problems such as anxiety and depression (Skinner & Piek, 2001; Francis & Piek, 2003; Tseng et al. 2007; Cairney et al. 2013).

For some time, research has highlighted the impact motor skills have on psychosocial functioning in children although this relationship has only recently been more thoroughly understood. In a comprehensive study of children and adolescents between the ages of 8 and 14, Skinner and Piek (2001) found that when compared to their normally coordinated peers, participants with DCD had lower perceptions of self, lower global self-worth, lower perceived self-competence and higher levels of anxiety. A study by Francis and Piek (2003) investigated the impact that self-perceptions of competency and perceived social support had on perceived self-worth and depressive symptoms in a sample of school aged children. Two groups of children were tested, one with DCD and a control group matched on age and sex. Their findings indicated that school-aged children with DCD had higher levels of depressive symptoms than their more motor competent peers. In a study by Ekornas et al. (2010), children aged 8 to 11 with anxiety disorders independent of other disorders were evaluated for impaired motor skills and poor self-perceptions. Their findings indicated that anxious boys were at a higher risk of

having motor problems whereas no significant findings were reported for girls. Their study also demonstrated no significant correlation between motor problems and poor self-perception. Finally, a study looking at the relationship between DCD, peer problems and internalizing and externalizing problems in children ages 5 to 11 found that more severe motor impairments caused more peer problems which caused more internalizing and externalizing problems (Wagner et al. 2012). Their study suggests that the pathway is only in part mediated by peer problems and that other variables are most likely at play.

A few studies that have used normative samples have tested the relationship between poor motor competence and internalizing problems. For example, Rigoli, Piek, & Kane (2012) tested a normative adolescent sample on the pathway between motor skills and internalizing problems via self-perceptions. It was proposed that motor skills would have both a direct and indirect effect on internalizing problems via self-perceptions but their findings concluded differently. Motor skills did not have a direct effect but only an indirect effect and both pathways (motor skills to self-perceptions and self-perceptions to internalizing problems) were shown to be significant. Viholainen, Aro, Purtsi, Tolvanen, & Cantell (2014) looked at the interconnections between motor skills and psychosocial wellbeing with the idea that school-related self-concepts played a role in mediating this relationship. They tested a normative sample of adolescent girls aged 12 to 16 and found that the link between motor skills and psychosocial well-being was stronger than that found for the mediators. This type of finding provides evidence that there may in fact be a direct foundational link between motor skills and psychosocial well-being.

In another study on a normative sample of adolescents aged 12 to 16, Mancini, Rigoli, Heritage, Roberts, & Piek (2016b) tested the pathway detailed in the Environmental Stress Hypothesis (Cairney et al. 2013). More specifically they tested whether the link between motor skills and internalizing problems was mediated by perceived social support. They hypothesized that motor skills would have an indirect effect on depressive symptoms as well as anxious symptoms via perceived social support (i.e. friends, family, and significant other). Their hypotheses were only partially supported in that motor skills had a direct effect on both depressive and anxious symptoms and only an indirect effect on depressive symptoms via perceived social support. No indirect effect was found for anxious symptoms via perceived social support. Although these last few studies used normative samples, none have tested pre-adolescent child populations. Studies connecting motor skills, psychosocial adjustment, peer victimization, physical inactivity and obesity in pre-adolescent children is therefore warranted.

The evidence that psychosocial and motor coordination problems frequently co-occur is prevalent. Although the causal factors between these two conditions are not yet clear, a few hypotheses have been shared. There is suspicion that their association could be due to a common etiology. For instance, it was suggested that the cerebellum is involved in both motor coordination and emotional regulation (Diamond, 2000; Schutter & Van Honk, 2009). This would suggest that a cerebellar dysfunction would impact both systems. The Environmental Stress Hypothesis also puts forward the role of the environment, suggesting that the relationship between psychosocial and motor coordination impairments does not exclusively stem from genetic factors. A handful of

longitudinal studies highlighted this by observing motor coordination problems at study onset and internalizing problems at study completion (when problems were not present at onset). For example, one of the first studies by Shaffer et al. (1985) tested for neurological soft signs ("a particular form of deviant performance on a motor or sensory test") at 7 years of age to which predicted anxiety disorders at 17 years of age. Afterward, Sigurdsson, Van Os, and Fombonne (2002) found that boys who had poor motor skills were more than three times as likely to have anxiety at ages 11 and 16, although no effect was found in girls. In another study exploring the relationship between anxious and depressive symptoms in children between the ages of 6 and 12 and the stability of motor performance between the ages of 4 months to 4 years, Piek, Barrett, Smith, Rigoli, & Gasson (2010) found that inconsistent gross motor scores predicted the degree of anxious and depressive symptomatology at school age. Lingam et al. (2012) showed that children with DCD at 7 years of age had a significantly higher risk of self-reporting depression symptoms and parent-reporting mental health problems at 10 years of age.

These longitudinal studies put forward the notion that poor motor coordination presents itself before any psychosocial problems arise. The other stressors arising either directly or indirectly from the primary stressor, that is the motor problems, may also reinforce psychosocial problems. Furthermore, existing literature often dichotomizes motor skills into clinical (DCD) and non-clinical groups. Early research frequently used clinical samples or severe motor impairments to understand this relationship (Skinner & Piek, 2001) but more recently it is being suggested that psychosocial development is better understood across the continuum of motor skills (Rigoli et al. 2012; Wilson, Piek,

& Kane 2013; Piek et al. 2015). First of all, most motor assessment tools use the 5th percentile as the cut-point for DCD (Cairney et al. 2010b), which eliminates the population of children that are at a subclinical level of DCD. In one of the first studies on psychosocial adjustment and motor skills, Schoemaker and Kalverboer (1994) observed a correlation between the severity of a child's clumsiness and their socially negative behaviour. Children who were only moderately clumsy showed more signs of socially negative behaviour than children who were severely clumsy. They stipulated that these children might be trying to conceal their clumsiness whereas children with severe motor deficiencies could not because their problems are simply too obvious. Dewey, Kaplan, Crawford, & Wilson (2002) investigated three groups, (1) children with DCD, (2) children suspect for DCD and (3) typically developing children, on problems of attention, learning and psychosocial adjustment. The DCD group and suspect-DCD group performed similarly on the measures of attention, reading, writing, spelling, and psychosocial adjustment, which was significantly different from the typically developing group. Their findings revealed that no matter the severity of the motor impairments, children are at risk for developmental problems. It has been suggested that children with subthreshold symptoms of mental health disorders are understudied (Polanczyc et al. 2015), which can be assumed to apply to other types of disorders. Furthermore, correlational studies using normative samples are especially important to better understand children with DCD (Roebers & Kauer, 2009). Oftentimes, testing clinical samples, which are those at the extreme end of the motor skill spectrum, overestimates the relationships between these concepts (Rigoli et al. 2012). Wassenberg et al. (2005)

explained it quite effectively by stating that motor skills are better studied as a continuum rather than a dichotomy.

In summary, based on the literature, it can be suggested that psychosocial problems, peer related difficulties, and physical inactivity and obesity can arise as a consequence of motor skill deficiency. However, these studies only offer a limited understanding of the interconnections between these constructs. This thesis is especially concerned with the ideas that poor motor skills are not the sole reason that these children experience more psychosocial problems than their peers. Other stressors undoubtedly contribute to these problems and are either a direct or indirect consequence of having poor motor coordination. We are also concerned with the types of children being studied. This thesis focuses on children at every degree of motor competence in order to paint a better picture of the interconnections between these relationships.

Research Objectives

This thesis was designed to better understand the connections between different aspects of motor, psychological, and social development. A correlational study is performed in a sample of normally developing children aged 7 to 10 years to examine motor competence as it relates to peer victimization, physical activity, weight status and psychosocial adjustment problems, namely anxiety symptoms, depression symptoms and loneliness.

Research Hypotheses

The current study aims at testing four hypotheses. Hypothesis one states that there will be a negative linear relationship between motor skills and psychosocial adjustment. Higher motor competence will generate lower psychosocial adjustment problems and will move along a continuum to lower motor competence generating higher psychosocial adjustment problems. Hypothesis two states that children with lower motor competence will experience more peer victimization than their more motor competent peers, exhibiting a negative linear relationship. Hypothesis three states that children with lower motor competence will be more obese and/or participate in less physical activity than their more motor competent peers. Hypothesis four states that more peer victimization and higher weight status will generate more psychosocial problems.

CHAPTER 2: RESEARCH ARTICLE SUBMISSION

The relationship between gross motor skills, psychosocial adjustment and peer victimization in school-aged children

Moriah Thorpe, Line Tremblay, Brahim Chebbi, and Céline Larivière.

Abstract: The aim of this study was to investigate the relationships between childrens' motor competence, psychosocial adjustment, peer victimization, physical activity participation and obesity. Using the Elaborated Environmental Stress Hypothesis as the framework, we hypothesized that multiple stressors influence children with poor motor competence and that the pathway from motor competence to psychosocial maladjustment is more complex than initially thought. A sample of child-parent dyads (n = 51; children ages 7 to 10 years), were recruited from two educational institutions in Sudbury, Ontario. Child participants completed self-report measures on peer victimization, depression symptoms, loneliness and anxiety symptoms across five dimensions (social phobia, obsessive-compulsive disorder, separation anxiety, panic disorder and generalized anxiety). Child participants also completed the Test of Gross Motor Development-3. Parent participants completed a sociodemographic questionnaire and a self-report questionnaire on their child's levels of participation in physical activity. For boys, Pearson product-moment correlations revealed that lower motor competence was significantly related to depressive symptoms, social phobia, separation anxiety symptoms, loneliness and peer victimization. For girls, lower motor competence was significantly related to separation anxiety symptoms and loneliness. No correlations were found between motor competence, weight status and physical activity participation. Findings are consistent with previous literature. These findings suggest that (1) boys are more psychosocially affected and victimized than girls when measured against motor competence and, (2) children are experiencing these issues as early as age 7, which is a time when children are starting to build social relationships. More research is required strengthen these findings.

Keywords: Gross Motor Skills, Motor Development, Psychosocial Maladjustment, Internalizing Problems, Anxiety, Depression, Loneliness, Peer Victimization, Bullying, Test of Gross Motor Development-3

Introduction

Mastery of gross motor skills is a prerequisite to engage successfully in physical activities throughout the lifespan. In preschool years, children acquire a basic repertoire of skills, however, mastery is dependent on continuous practice, encouragement, feedback and instruction (Gallahue & Ozmun, 2006). Good motor skills are an important correlate to many health-related behaviours and outcomes and have an especially important connection with psychosocial wellbeing (Skinner & Piek, 2001; Piek, Baynam & Barrett, 2006). According to the most commonly reported prevalence rates, 5-6% of children meet the diagnostic criteria for developmental coordination disorder (DCD) (APA, 2013), which is broadly defined as a marked impairment in the development of motor coordination (APA, 2013). This represents approximately 215,000 Canadian children (Statistics Canada, 2016). Moreover, children between the 5th and 15th percentile on motor competence are considered to have borderline motor impairment (Henderson & Sugden, 1992). Children with low motor competence experience many negative psychosocial consequences because of their inability to perform tasks that require a certain level of motor competence (Cairney, Rigoli & Piek, 2013). These consequences include withdrawal, social isolation and social problems (Chen, Tseng, Hu, & Cermak, 2009, Smyth & Anderson, 2000; Tseng, Howe, Chuang, & Hsieh, 2007; Schoemaker & Kalverboer, 1994), low self-esteem (Miyahara & Piek, 2006), low global self-worth (Skinner & Piek, 2001), less acceptance by peers, less playmates, less likely to be asked to play with other children, (Schoemaker & Kalverboer, 1994) and less social support

(Skinner & Piek, 2001). Other studies show that these children are more victimized by their peers (Campbell, Missiuna & Vaillancourt, 2012) and have increased internalizing problems such as anxiety and depression (Skinner & Piek, 2001; Francis & Piek, 2003; Tseng et al., 2007; Cairney et al. 2013).

Although research strongly suggests an important relationship between motor competence and psychosocial adjustment (Skinner & Piek, 2001; Francis & Piek, 2003; Tseng et al., 2007; Cairney et al. 2013), the pathway between low motor competence and psychosocial problems is still poorly understood (Cairney et al. 2013). Generally speaking, motor difficulties themselves are often thought to be a direct cause of psychosocial problems (Cairney et al. 2013). However, a theoretical framework first coined by Cairney, Veldhuizen and Szatmari (2010) and later elaborated by Cairney et al. (2013) known as the Elaborated Environmental Stress Hypothesis, posits that indirect or mediating factors precede the psychosocial problems that eventually manifest themselves due to low motor competence. In other words, a primary stressor like low motor competence does not always directly correlate with psychosocial adjustment problems. The authors suspected that secondary stressors may contribute to anxiety, depression and loneliness experienced by children with low motor competence. Interestingly, it has been suggested that the relationship between motor and psychosocial adjustment problems could be due to a common aetiology; for instance, the cerebellum is involved in motor coordination and emotional regulation (Diamond, 2000; Schutter & Van Honk, 2009). On the other hand, many studies suggest that having motor difficulties may be accompanied by unique environmental experiences (Lingam et al. 2012; Piek, Barrett, Smith, Rigoli, & Gasson 2010; Shaffer et al. 1985; Sigurdsson, Van Os, and Fombonne,

2002). For example, a study by Piek et al. (2007) reported that a child with developmental coordination disorder had more depressive symptoms than their monozygotic twin without DCD. They suggested that unique environmental experiences, such as negative feedback from peers and poor self-perceptions may be reasons why children with low motor competence are predisposed to psychosocial adjustment problems (Piek et al. 2007). Indeed, a handful of longitudinal studies highlight this as well. Piek et al. (2010) found that inconsistent gross motor scores between the ages of 4 months and 4 years predicted the degree of anxious and depressive symptoms between the ages of 6 and 12 years. Furthermore, Lingam et al. (2012) showed that children with DCD at 7 years of age had a significantly higher risk of self-reporting depression symptoms and parent-reporting mental health problems at 10 years of age. These studies imply that not only are children with low motor competence manifesting psychosocial adjustment problems as a result of their impairments, but also are doing so because of specific negative experiences. A few studies have sought to look at these negative experiences or "secondary stressors". In particular, Rigoli, Piek and Kane (2012) tested motor skills and psychosocial adjustment via self-perceptions, and Mancini et al. (2016b) tested motor skills and psychosocial adjustment via perceived social support. Other components and pathways of the Elaborated Environmental Stress Hypothesis continue to be evaluated, however, due to its breadth, only sections of it have been empirically studied (Mancini, Rigoli, Cairney, Roberts, & Piek, 2016a; Piek et al. 2015).

Most research evaluating the relationship between motor competence and psychosocial adjustment have included children with motor deficits (Skinner & Piek, 2001; Dewey, Kaplan, Crawford, & Wilson, 2002; Poulsen, Ziviani, Cuskelly, & Smith,

2007). Most motor assessment tools use the 5th percentile as the cut-point for DCD (Cairney, Veldhuizen & Szatmari, 2010), which ignores a population of children that are at a sub-clinical level for DCD. Research has shown that no matter the severity of the motor impairments, children are at risk of experiencing different types of problems related to behaviour and adjustment (Schoemaker & Kalverboer, 1994; Dewey et al. 2002). It has also been suggested that children with subthreshold symptoms of mental health disorders are understudied (Polanczyk, Salum, Sugaya, Caye, & Rohde, 2015), which could also be extended to physical disorders. Wassenberg et al. (2005) explained it quite effectively by stating that motor skills are better studied as a continuum rather than a dichotomy. It has been suggested that cognitive processes are better understood when studied in normative samples (Roebers & Kauer, 2009). By extension, a better understanding of children with DCD can be garnered (Roebers & Kauer, 2009) compared to testing children at the extreme end of the motor skill spectrum. This can usually result in overestimating the relationship between motor competence and psychosocial adjustment problems (Rigoli et al. 2012).

More recent studies have used normative samples to look at this relationship in order to understand the full spectrum of motor skills. Rigoli et al. (2012) and Mancini et al. (2016b) tested the relationship between motor competence and psychosocial adjustment problems in a normative sample of adolescents. In addition, Piek et al. (2010) gathered participants from a larger study for which motor skills were not the main focus to test the relationship between motor skills and psychosocial adjustment across the full spectrum of functioning. These studies provide evidence to support the notion that a negative linear relationship exists between motor competence and psychosocial

wellbeing. Normative and non-clinical studies on child populations, which are scarce, will help explore this concept further.

In the current study, peer victimization, a component derived from the model, is tested as a secondary stressor. Children with low motor competence are often unsuccessful when trying to perform in daily activities that require a certain level of motor skill, making them an easy target to aggressors because of their observable impairment (Vessey, Duffy, O'Sullivan, & Swanson, 2004). In Western society, value is placed on skillfulness (Shoemaker & Kalverboer, 1994). In this context, some studies have demonstrated that low motor competent children experience more peer victimization than their more motor competent peers (Campbell et al. 2012), and are less preferred by their peers in both play and classroom settings (Livesey, Lum Mow, Toshack, & Zheng, 2011). Research has shown that peer victimization can be very serious, especially in terms of psychosocial functioning (Hawker & Boulton, 2000). For example, victimized children are more likely to suffer from internalizing problems such as symptoms of depression (Austin & Joseph, 1996), anxiety (Hawker & Boulton, 2000), feelings of loneliness (Boulton & Underwood, 1992; Crick & Bigbee, 1998) and emotional distress (Crick & Bigbee, 1998). Evidence points toward a pathway between motor competence, peer relationships and psychosocial adjustment (Campbell, et al. 2012, Piek, Barrett, Allen, Jones, & Louise 2005; Vannatta, Gartstein, Zeller, & Noll, 2009), although more research is required.

Another secondary stressor identified in the model, and included in the current study, is weight status (Cairney et al. 2013). It has been shown that low motor competent children participate in less physical activity (Cantell, Crawford & Tish Doyle-Baker,

2008; Cairney et al. 2005b), which may result in overweight and obesity (Cairney et al., 2005a). Children who are overweight or obese are less inclined to participate in physical activity (Trost, Sirard, Dowda, Pfeiffer, & Pate, 2003), which may contribute to acquiring less motor experiences and thus being behind in motor development (Morano, Colella & Caroli, 2011). Obesity in itself increases the risk of experiencing peer-related difficulties (Pitrou, Shojaei, Wazana, Gilbert, & Kovess-Masféty, 2010). In fact, Puhl et al. (2016) reported that weight-based bullying is the most prevalent form of bullying across all countries and over any other type of bullying. Although the literature is somewhat inconclusive about psychosocial problems related to obesity in children (Erickson, Robinson, Haydel, & Killen, 2000; Quek et al. 2017), it has been suggested that obesity is linked to anxiety (Vila et al. 2004; Esposito et al. 2014), depressive symptoms (Csábi, Tényi, & Molnár, 2000; Esposito et al. 2014), and loneliness (Mériaux, Berg, & Hellström, 2010).

Based on the literature, it can be suggested that psychosocial adjustment problems, peer related difficulties, physical inactivity and obesity can arise as a consequence of motor skill deficiency. However, the studies we reviewed only offer a limited understanding of the interconnections between these constructs. The abovementioned literature review demonstrates that low motor competence is not the only reason these children experience more psychosocial adjustment problems than their peers. There seem to be secondary stressors that contribute to these problems acting as either direct or indirect consequences to low motor competence. Furthermore, the extent that children's characteristics, such as their specific degree of motor competence, affect their psychosocial adjustment remains an open question.

The current study aims at testing four hypotheses. Hypothesis one states that there will be a negative linear relationship between motor skills and psychosocial adjustment. Higher motor competence will generate lower psychosocial adjustment problems and will move along a continuum to lower motor competence generating higher psychosocial adjustment problems. Hypothesis two states that children with lower motor competence will experience more peer victimization than their more motor competent peers, exhibiting a negative linear relationship. Hypothesis three states that children with lower motor competence will be more obese and/or participate in less physical activity than their more motor competent peers. Hypothesis four states that more peer victimization and higher weight status will generate more psychosocial problems.

Method

Participants

A total of 51 children (45.1% female) between 7 and 10 years of age (M = 8.39 years; SD = 1.11) and their parent participated in this study. Child-parent dyads were recruited from a French-speaking public school and from a local post-secondary institution. For almost all of the child-parent dyads, the parent responding to the questionnaires was the biological mother of the child (n=43). The majority of parents were married (n = 39; 78%), while approximately one-quarter of the parents were single, separated, or divorced (n = 11; 22%). Nearly three-quarters of parents reported having an annual household income of $100,000 or more (n = 38; 74.5%) and nearly three-quarters of parents reported having completed post-secondary education (n = 35; 71.4%).

Procedure

Permission to collect data was granted by the University's Research Ethics Board. Recruitment and testing was performed in two locations; the first was a French public elementary school and the second was a post-secondary institution. To enroll in the study, invitation forms were sent home to parents, inviting them and their child to participate. If the invitation was signed and returned to the school, an envelope was sent back home with the following: (1) consent form, (2) physical activity readiness questionnaire for children, (3) sociodemographic questionnaire and (4) physical activity questionnaire for parents. Participants who were recruited through the post-secondary institution were invited verbally and handed an envelope upon agreeing to participate.

Every time an envelope was returned and completed, the researcher began the testing process on the child participant. Testing occurred in two stages at the child's school or at the post-secondary institution. During the first phase of testing, a one-on-one session was conducted for each child participant to complete the psychosocial questionnaires and anthropometric measurements in a private room. The researcher explained the procedure to each child, making sure the child fully understood, provided assent and felt comfortable answering the questions. The child was told that the questions were not school related, their names would not be associated with the answers they provided, they could refuse to answer any single question if they felt uncomfortable and they could refuse to participate entirely without penalty. The self-report measures were all read aloud by the researcher while the child followed along and answered each question accordingly. The Physical Activity Questionnaire for Children, the Revised Child Anxiety and Depression Scale, the Loneliness and Social Dissatisfaction Scale and

the modified Schwartz Peer Victimization Scale were administered. Finally, the child's sex and anthropometric measurements (height and weight) were noted. Each session took anywhere between 30 and 45 minutes to complete depending on the child's cognitive ability.

The second stage of testing was typically performed on a separate day once the questionnaires were completed. The researcher and one or two research assistants administered the Test of Gross Motor Development-3 (TGMD-3) in a gymnasium. Both the main researcher and research assistants were trained on the TGMD-3. Testing was typically done in groups of no more than two but never exceeded five at one time. The main researcher explained and demonstrated the movement skills as outlined in the TGMD-3, while the research assistants scored the child according to the test criteria. This session took on average 20 minutes per child.

Measures

Test of Gross Motor Development-3

The Test of Gross Motor Development-3 (TGMD-3) by Ulrich (2013) was used and assesses 13 fundamental movement skills with both locomotor and ball skills subscales. The locomotor subtest includes running, skipping, horizontal jumping, hopping, galloping, and sliding. The object control subtest includes 2-hand striking, stationary dribbling, catching, kicking, overhand throwing, and underhand rolling. The TGMD-3 is a process-oriented measure that assesses different components of each skill rather than the final product or outcome. Its predecessor, the TGMD-2, was standardized on a large sample of children in the United States (Ulrich, 2000). Subsequent studies

have collected data to validate the tool across other populations (Farrokhi, Zadeh, Kazemnejad, & Ilbeigi 2014; Kim, Kim, Valentini, & Clark, 2014; Wong & Cheung, 2010). The current research uses the third and most recent version of the TGMD. Normative data is currently being collected for the third edition of the test. In a recent evaluation of the psychometric properties of the TGMD-3, Ulrich and Webster (2017) report that the test has a high degree of reliability and validity, including excellent internal consistency and test-retest reliability. Cronbach's α was between 0.95 and 0.98 across all ages. This preliminary study did not however report on whether there were significant differences in motor skill development after the age of 7. As children typically develop to a skillful (but not necessarily mature) level in most of the fundamental motor skills by the age of 7 (Gabbard, 2011), we interpreted the scores similarly for each age group.

Revised Child Anxiety and Depression Scale

The Revised Child Anxiety and Depression Scale (RCADS) by Chorpita, Yim, Moffitt, Umemoto and Francis (2000) was used to assess anxiety and depression symptoms. The questionnaire has 47 items with subscales that include symptoms associated with separation anxiety disorder, social phobia, generalized anxiety disorder, panic disorder, obsessive-compulsive disorder, and major depressive disorder. Validation studies suggest that the test structure is consistent with *DSM-IV* anxiety disorders and depression. However, these measures cannot be used as diagnostic tool for the purpose of the current research and the author will refer to symptoms rather than the diagnostic labels. Alpha coefficients for each subscale ranged from α = .71-.85 (Chorpita et al.

2000). Cronbach's α for the complete test in this sample was .90 and for each subscale, .77, .77, .60, .76, .69, and .56 respectively.

Loneliness and Social Dissatisfaction Scale

The Loneliness and Social Dissatisfaction Scale by Cassidy & Asher (1992) first designed by Asher, Hymer & Redshaw (1984) and revised by Asher & Wheeler (1985) is a 24-item self-report scale containing 16 items measuring perceptions of loneliness and eight filler items. Higher scores indicated lower feelings of loneliness. This questionnaire has been shown to have excellent psychometric properties, high internal consistency and good test-retest reliability (Goossens & Beyers, 2002). In a review of loneliness measures by Goossens and Beyers (2002), Cronbach's α in three separate samples exceeded .80. Cronbach's α in this sample was .72.

Schwartz Peer Victimization Scale (Modified)

The Schwartz Peer Victimization Scale (SPVS) is a 5-item self-report measure of peer victimization (Schwartz, Farver, Change, & Lee-Shin, 2002). For the purpose of this study, it was modified to include two further items ("How often do other kids ignore you?" and "How often do other kids say mean things to you online?"). These items were added to measure passive aggressive behaviour (relational victimization) and cyberbullying due to the increasing use of electronics to target individuals (Lamb, Pepler & Craig, 2009). The final scale has a total of seven items and was used in this study to measure peer victimization. Higher scores indicate a higher level of peer victimization. The measure has good internal consistency (α = .75) and correlated modestly and

positively with teacher (R = .32, p > .001) and peer reports (R = .39, p > .001) of victimization (Schwartz et al., 2002). Cronbach's α in this sample was .87.

Physical Activity Questionnaire for Parents

1. *Child daily physical activity*

   Within the questionnaire, parents were asked to indicate the total amount of time, on average, that their child participated in daily physical activity. The items were rated on a four-point Likert scale as follows: 1) Less than 30 minutes per day, 2) 30 to 60 minutes per day, 3) 60 to 120 minutes per day, and 4) 120 minutes or more per day (M = 2.8; SD = .72). Based on the physical activity guidelines for children and youth (Tremblay et al. 2011; WHO, 2010), the scale was dichotomized into less than an hour of physical activity per day (n = 22; 43.1%) and one hour or more of physical activity per day (n = 29; 56.9%).

2. *Parent's perception of intensity of child activity*

   Additionally, the questionnaire asked parents to rate their perception of the intensity of their child's activity at different times during the day: before breakfast (M = 1.6; SD = .73), morning (M = 2.9; SD = .62), early afternoon (M = 3.4; SD = .66), late afternoon (M = 3.5; SD = .9), after dinner (M = 3.3; SD = 1.1). A five-point Likert scale was used: 1) not at all active, 2) slightly active, 3) moderately active, 4) very active, and 5) highly active. An overall activity intensity level was computed for each child participant and then each child was categorized into three groups: inactive (an average score < 3.0), moderately active (an average score ≥ 3.0 and < 4.0) and highly active (an average score ≥ 4.0).

3. *Child characteristics*

The parent questionnaire also inquired about their child's date of birth, sex and the number of hours spent by their child watching TV or videos each day (M = 1.4; SD = 1.1).

Anthropometric measurements

Body weight (to the nearest 0.1 kg) and standing height (to the nearest cm) were determined using a scale and a portable tape measure. Weight status for each child was determined using the body mass index (BMI). Each child was classified in one of the three following categories: 'normal weight' (between 3rd and 85th percentile), 'overweight' (between 85th and 97th percentile) or obese (>99.9th percentile). Overall, thirty-seven children were considered normal weight (72.5%), whereas ten children were overweight (19.6%) and four children were obese (7.8%). There were no significant gender differences in the proportion of children who were normal weight and those who were overweight and obese, $\chi 2$ (1) = .19, p=.67.

Results

All statistical analyses were performed using the Statistical Package for the Social Sciences, SPSS-20. We first conducted a series of two-way ANOVAs to compare boys and girls on psychosocial adjustment variables and gross motor skills. Second, we conducted Pearson product-moment correlations to test our four hypotheses postulating significant relationships between psychosocial adjustment measures, gross motor skills and children's characteristics.

Table 1 shows descriptive statistics comparing male and female participants on psychosocial adjustment variables. We did not find significant gender differences on peer victimization ($F_{(1,49)}$ = 2.31, p = .14), loneliness ($F_{(1,49)}$ = .75, p= .39), depression symptoms ($F_{(1,49)}$ = 1.19, p = .28), generalized anxiety symptoms ($F_{(1,49)}$ = .15, p = .71), obsessive-compulsive symptoms ($F_{(1,49)}$ = .45, p = .50), panic disorder symptoms ($F_{(1,49)}$ = .02, p= .90, separation anxiety symptoms ($F_{(1,49)}$ = .01, p= .92), and on social phobia symptoms ($F_{(1,49)}$ = .11, p= .74). Table 2 shows means, standard deviations, and F-values comparing male and female participants on gross motor skills. We first found significant gender differences in the ball skills subscale ($F_{(1,49)}$ = 9.72, p> .01), with boys exhibiting higher skills (M = 46.4, SD = 7.8) than girls (M = 39.4, SD = 8.0). Second, we found significant gender differences on the total motor score ($F_{(1,49)}$ = 4.35, p > .05), with boys exhibiting higher skills (M = 83.3, SD = 11.9) than girls (M = 76.4, SD = 11.2). However, no significant differences were noted between boys and girls on the locomotor skills subscale ($F_{(1,49)}$ = .01, p= .93).

Table 1. *Means (SD) and F-value for psychological variables*

Measures/Variables	Female	Male	*F*
Schwartz Peer Victimization	1.5 (.5)	1.8 (.8)	2.31
Loneliness and Social Dissatisfaction	2.5 (.2)	2.4 (.3)	0.75
Major Depression	8.2 (2.7)	6.8 (3.8)	1.19
Generalized Anxiety	6.8 (3.6)	6.4 (2.5)	0.15
Obsessive-Compulsive	6.7 (3.8)	6.2 (4.1)	0.45
Panic Disorder	5.9 (4.5)	4.9 (4.2)	0.02
Separation Anxiety	7.0 (4.9)	5.1 (4.4)	0.01
Social Phobia	11.0 (5.4)	8.8 (4.9)	0.11

*P < 0.05, **P < 0.01, ***P < 0.001.

Table 2. *Means (SD) and F-value for gross motor skills*

Measures/Variables	Female	Male	*F*

Ball Skills	39.4 (8.0)	46.4 (7.8)	9.72**
Locomotor Skills	37.0 (4.9)	36.9 (6.2)	0.01
Total Scores	76.4 (11.2)	83.3 (11.9)	4.35*

*$P < 0.05$, **$P < 0.01$, ***$P < 0.001$.

We performed Pearson product-moment correlation analyses to examine associations between all the variables. The analyses were conducted separately for boys and for girls. The results are shown in Table 3 and 4. Our first hypothesis stated that there would be a negative linear relationship between motor skills and the psychosocial adjustment variables. To test this first hypothesis, correlation analyses were conducted between motor competence and psychosocial variables (i.e. symptoms of depression, generalized anxiety, obsessive-compulsive, panic disorder, separation anxiety, social phobia, and loneliness). For boys, it was found that total motor competence was negatively associated with depressive symptoms (R = -.72, p < .001), separation anxiety symptoms (R = -.47, p < .05) and social phobia symptoms (R = -.54, p < .01). For boys, higher gross motor competence was associated with less symptoms of depression, anxiety and social phobia. More specifically, depressive symptoms had a strong and significant negative correlation with the ball skills subscale (R = -.79, p < .001) but only a moderate negative correlation with the locomotor skills subscale (R = -.37, p < .05). Separation anxiety symptoms had a moderate and significant negative correlation with the locomotor skills subscale (R = -.44, p < .05). Social phobia symptoms had a strong and significant negative correlation with the ball skills subscale (R = -.56, p < .01). Third, we found a significant positive correlation between the ball skills subscale and loneliness (R = .44, p < .05). Higher scores on the Loneliness and Social Dissatisfaction Scale indicate less overall loneliness which means that higher scores on the ball skills subscale are

associated with less reported loneliness. Finally, for our boy's subsample, motor performance did not significantly correlate with the other items in the RCADS; that is, obsessive compulsive symptoms (R = -.22, p = .26), panic disorder symptoms (R = -.33, p = .09) or generalized anxiety symptoms (R = -.34, p = .07). In girls, we first found a positive and significant correlation between the ball skills subscale and reported loneliness (R = .45, p < .05), that is, low motor competence was associated with higher reports of loneliness. Second, we found a significant negative correlation between the locomotor subscale and separation anxiety symptoms (R = -.44, p < .05). For girls, motor performance did not significantly correlate with the other items in the RCADS; that is, depression symptoms (R = -.00, p = .99), obsessive-compulsive symptoms (R = .75, p = .73), panic disorder symptoms (R = .28, p = .19), social phobia (R = -.15, p = .51), or generalized anxiety symptoms (R = -.01, p = .96). These results support our hypothesis on a large portion of the variables.

Our second hypothesis stated that children with lower motor competence would experience more peer victimization than their more motor competent peers. To test this hypothesis, we conducted Pearson product-moment correlations between motor competence and reported peer victimization. For boys, we found a significant negative correlation between motor competence total score and reported peer victimization (R = -.44, p < .05) and, more specifically with the locomotor skills subscale (R = -.49, p < .01). We did not find any significant correlation between motor competence and reported peer victimization in girls (R = -.19, p = .39). Therefore, our hypothesis was only supported for boys in this sample.

Our third hypothesis stated that children with lower motor competence would be more overweight and/or participate in less physical activity than their more motor competent peers. To test this hypothesis, we conducted Pearson product-moment correlations between physical activity (as reported by parents), motor competence and weight status. In both boys and girls, we did not find any significant correlation between motor competence and physical activity (boys: $R = .29$, $p = .15$; girls: $R = .40$, $p = .06$) or weight status (boys: $R = -.07$, $p = .74$; girls: $R = .07$, $p = .75$). Therefore, our hypothesis was not supported.

Our final hypothesis stated that more peer victimization and higher weight status would generate more psychosocial adjustment problems. To test this hypothesis, we conducted Pearson product-moment correlations between reported peer victimization and the psychosocial adjustment variables, as well as between weight status and the psychosocial adjustment variables. For boys, reported peer victimization had a significant positive correlation with all psychosocial variables except for depression symptoms ($R = .29$, $p = .14$) and loneliness ($R = -.10$, $p = .61$); that is, generalized anxiety symptoms ($R = .62$, $p < .001$), obsessive compulsive symptoms ($R = .37$, $p < .05$), panic disorder symptoms ($R = .43$, $p < .05$), separation anxiety symptoms ($R = .57$, $p < .01$) and social phobia symptoms ($R = .58$, $p < 0.001$). For girls, reported peer victimization was found to have a positive correlation with depression symptoms ($R = .58$, $p < .05$), and social phobia symptoms ($R = .49$, $p < .01$). No correlations were found between peer victimization and generalized anxiety symptoms ($R = .38$, $p = .75$), obsessive-compulsive symptoms ($R = .30$, $p = .17$), panic disorder symptoms ($R = .30$, $p = .16$), or separation anxiety symptoms ($R = .36$, $p = 0.10$). For boys, no correlations were found between

weight status and the psychosocial variables, that is depression symptoms (R = .00, p = 0.99), generalized anxiety symptoms (R = -.24, p = .22), obsessive-compulsive symptoms (R = .01, p = .97), panic disorder symptoms (R = -.20, p = .30), separation anxiety symptoms (R = .10, p < .60) or social phobia symptoms (R = -.17, p = .39). For girls, no correlations were found between weight status and the psychosocial adjustment variables, that is depression symptoms (R = -.26, p = 0.24), generalized anxiety symptoms (R = -.33, p = .13), panic disorder symptoms (R = -.24, p = .27), separation anxiety symptoms (R = -.20, p < .36) or social phobia symptoms (R = -.34, p = .12). However, obsessive-compulsive symptoms were found to have a negative correlation with weight status (R = -.52, p < .05). Our hypothesis was supported when comparing peer victimization with the psychosocial adjustment variables but was not supported when comparing weight status with the psychosocial adjustment variables.

Table 3. *Correlations of Study Variables (Male)*

3 Scale	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 - Major Depression	1.00													
2 - Generalized Anxiety	.26	1.00												
3 - Obsessive Compulsive	.18	.23	1.00											
4 - Panic Disorder	.25	.36	.37	1.00										
5 - Separation Anxiety	.30	.44*	.55**	.58***	1.00									
6 - Social Phobia	.47*	.63***	.28	.56**	.53**	1.00								
7 - Peer Victimization	.29	.62***	.37*	.43*	.57**	.58***	1.00							
8 - Loneliness	-.57**	-.26	.24	-.02	-.05	-.12	-.10	1.00						
9 - Age	-.33	-.06	-.61***	-.25	-.31	-.14	-.33	.09	1.00					
10 - TGMD-3 Ball Skills	-.79***	-.31	-.24	-.27	-.37	-.56**	-.28	.44*	.43*	1.00				
11 - TGMD-3 Locomotor Skills	-.37*	-.27	-.22	-.29	-0.44*	-.34	-.49**	.23	.20	.43*	1.00			
12 - TGMD-3 Final Score	-.72***	-.34	-.27	-.33	-.47*	-.54**	-.44*	.41*	.39*	.88***	.80***	1.00		
13 - Physical Activity	-.40*	-.08	-.26	-.18	-.28	-.21	-.06	.01	.21	.25	.24	.29	1.00	
14 - Weight Status	.00	-.24	-.01	-.20	.10	-.17	-.01	-.14	-.12	-.06	-.05	-.07	.23	1.00

*$P < 0.05$, **$P < 0.01$, ***$P < 0.001$.

Table 4. *Correlations of Study Variables (Female)*

4 Scale	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 - Major Depression	1.00													
2 - Generalized Anxiety	.54**	1.00												
3 - Obsessive Compulsive	.56**	.57**	1.00											
4 - Panic Disorder	.57**	.52*	.70***	1.00										
5 - Separation Anxiety	.19	.44*	.35	.29	1.00									
6 - Social Phobia	.53**	.67***	.48*	.36	.50*	1.00								
7 - Peer Victimization	.58**	.38	.30	.30	.36	.49*	1.00							
8 - Loneliness	-.17	-.19	-.28	-.34	-.10	-.18	-.19	1.00						
9 - Age	.57**	.30	.46*	.64***	.27	.22	.43*	-.05	1.00					
10 - TGMD-3 Ball Skills	.05	.06	.12	.40	.11	.00	-.07	.45*	.35	1.00				
11 - TGMD-3 Locomotor Skills	-.09	-.12	-.02	.00	-.44*	-.33	-.32	.39	.03	.47*	1.00			
12 - TGMD-3 Final Score	-.00	-.01	.08	.283	-.17	-.15	-.19	.49*	.26	.92***	.78***	1.00		
13 - Physical Activity	0.01	0.12	-.03	.10	.04	.06	.11	.14	.22	.43*	.21	.40	1.00	
14 - Weight Status	-.26	-0.33	-.52*	-.24	-.20	-.34	.09	.35	-.09	.05	.08	.07	.39	1.00

*$P < 0.05$, **$P < 0.01$, ***$P < 0.001$.

Discussion

The aim of this study was to examine the relationship between aspects of gross motor skills, self-reported peer victimization, and self-reported psychosocial adjustment variables (i.e. anxiety, depression, loneliness), physical activity and weight status in a sample of sub-clinical, normally developing children aged 7 to 10 years. In boys, lower motor competence was directly correlated with higher levels of depressive symptoms. These findings are consistent with previous research such as that of Francis & Piek (2003) who investigated the relationships between perceived social support and self-worth on depression symptoms in children with DCD. Their findings indicated that depression symptoms were greater in the DCD group compared to their control group. It was also shown that there was no pathway or mediating effect between DCD and depression symptoms via self-worth. In their study, only athletic competence was shown to have a direct effect on depression symptoms in children with DCD. Even though our sample in the current study was sub-clinical, this relationship was found, suggesting that depression symptoms do not only affect boys with DCD but also boys that may not necessarily meet clinical cut-point criteria. In addition, higher motor competence corresponded to less depressive symptoms, providing a unique perspective on the relationship between motor competence and psychosocial adjustment.

Social phobia symptoms were also found to correlate with low motor competence in boys in the current study. These results are in alignment with those of Pratt and Hill (2011) who reported nearly 30% of the children in their DCD group experienced social phobia at a clinically significant level. This can be explained by a number of studies that suggest that children with low motor competence have lower perceptions of social

support (Skinner & Piek, 2001), and social acceptance (Schoemaker & Kalverboer, 1994), and are more rejected by their peers (Livesey et al. 2011) causing social environments to be feared. In the present study, separation anxiety symptoms correlated negatively with total motor competence in boys and locomotor competence in girls, which has not been reported in earlier studies. This finding suggests that low motor competent boys and girls may suffer from attachment issues. In their study, Pratt and Hill (2011) reported panic anxiety as the most prominent form of anxiety in their sample, with almost 50% of their DCD group reporting higher levels of panic, a finding that was not supported in the present study. However, they did remark on the variability in anxiety disorders in children with DCD. They looked at individual differences in their data and noted that the types of anxiety that children reported were not always the same (Pratt & Hill, 2011). That is to say, psychosocial adjustment problems may be vastly different across groups and individuals, making it likely that different studies will find varying forms of psychosocial adjustment problems to be at the forefront. Studies such as those of Mancini et al. (2016b), Rigoli et al. (2012), and Pearsall-Jones et al. (2011) measured separation anxiety as a component of their total anxiety scores although they did not report on the type of anxiety specifically. In all of these studies, total anxiety scores were always higher in children with low motor competence scores. From a different perspective, Vila and colleagues (2004) had similar findings when they studied children and adolescents suffering from overweight or obesity. Thirty-two percent of their sample had at least one psychiatric anxiety disorder with social phobia and separation anxiety appearing very frequently. Their interpretation of the results would be similar to ours in that these children fear social environments due to criticism from peers (whether because

of their weight or their motor competence) and for that reason, are more dependent on family and parental figures (Vila et al. 2004). This creates a cycle of social avoidance, further reinforcing dependence on close family members, and heightening anxiety related to social contact (Vila et al. 2004). Furthermore, because the emphasis to succeed in physical activities is very high and almost every social activity in a child's life revolves around play, children with low motor competence can be incessantly fearful.

We found that self-reported peer victimization negatively correlated with motor competence for boys only. Although some researchers have found that girls and boys are equally likely to be victimized (Boulton & Smith, 1994; Jimerson, Swearer, & Espelage, 2010), others have suggested that boys are generally more victimized than girls (Espelage, Bosworth, & Simon, 2000; Nansel et al. 2001; Iossi Silva et al. 2013). A possible explanation resides in the fact that, historically and in modern day society, sports have been incessantly associated with masculinity (Adams, Anderson, McCormack, 2010; Lee, Fredenburg, Belcher, & Cleveland, 1999). In addition, populations have been socialized to see sports as a male dominant activity (Senne, 2016), and boys have been known to place more value on sport than girls (Lee, Carter, & Xiang, 1995). These social constructs may explain why boys in our study reported more victimization and anxiety than their female counterparts. Some research findings support this explanation. For example, Livesey et al. (2011) found that boys with lower motor competence were less preferred by their peers than were girls when scored on a peer rating scale in both play and classroom settings. Sigurdsson and colleagues (2002) found that mothers of boys with low motor competence were three times more likely to report their sons having anxiety problems at ages 11 and 16 whereas no effect was found for girls. Likewise,

Ekornas, Lundervold, Tjus, and Heimann (2010) found that children with anxiety disorders displayed a higher degree of motor problems for which a much larger effect was found for boys.

Another notable finding was that higher reported loneliness in boys and girls was associated with lower motor competence. Although very few studies have looked at reports of loneliness in this population, a few have described similar findings (Poulsen et al. 2007; Schoemaker & Kalverboer, 1994; Smyth & Anderson, 2000). For example, Poulsen et al. (2007) reported that boys with DCD had significantly higher levels of loneliness than their non-DCD counterparts. These boys were also much less likely to participate in both structured and unstructured play activities. Other studies have reported that low motor competent children report having less playmates, are much less likely to be asked to play with other children (Schoemaker & Kalverboer, 1994) and spend more time alone (Smyth & Anderson, 2000).

Although most studies have supported the notion that motor competence is significantly related to participation in physical activity (Barnett et al. 2009; Lopes, Rodrigues, Maia, & Malina 2011; Lubans, Morgan, Cliff, Barnett, & Okely, 2010; Reillo, Vlahov, Bohren, Leppo, & Davis, 2010), our study did not support this, nor did it support higher weight status in children with low motor competence. Several reasons might explain this lack of association. First, our sample size is very small, preventing us to compare our participants according to their weight status, age, gender and, physical activity on motor skills acquisition. Second, it is also possible that our participants weight status did not impact motor skills. This explanation is supported by the findings of Okely, Booth, & Chey (2004) and Southall, Okely, & Steele (2004) who report that for

most age groups, object control skills are unrelated to a child's weight status. However, these studies revealed that contrary to object control, locomotor skills are indeed influenced by weight status, as they report lower skills in the group of children that are overweight (Okely et al. 2004; Southall et al. 2004). Finally, another possible explanation could be the fact that our child participants have not yet reached the point at which their motor skill proficiency has been longstanding enough to acquire more weight.

The current study has several strengths. First, we used a validated direct measurement of gross motor skills, which allows a direct assessment of the child's physical ability. Second, psychological symptoms and peer victimization questionnaires were administered by the researcher to children by mean of a face-to-face interview, which helps avoid errors around comprehension since the child could ask the meaning of a question if needed. Also, another advantage of the one-on-one interview is that the researcher was able to build a strong rapport and deeper level of trust with the child before answering the questions.

The results of the current study must be interpreted with caution in light of several limitations. First, the sample is small and therefore the findings may not be generalizable to a broader segment of the population. Second, we did not use parent and teacher reports as proxies to compare the child's perceptions. Third, the nature of the study required the participant to reveal sensitive and personal information, which may prevent them from fully disclosing their concerns or symptoms. Finally, our sample may have a selection bias, that is, parents of children with moderate to severe motor impairments may have been less inclined to participate for fear of putting their child in a vulnerable situation.

Conclusion

This study found statistically significant correlations between motor competence, self-reported peer victimization and many self-reported psychosocial adjustment variables that include depression symptoms, social phobia symptoms, separation anxiety symptoms, and loneliness in boys. Although we did not find similar results in girls, we did find statistically significant correlations between motor competence and separation anxiety symptoms and self-reported loneliness. It is important to raise awareness amongst parents, teachers, and health care professionals about early identification and interventions that could potentially minimize the risks of children experiencing psychosocial adjustment problems associated with this condition. Considering the importance motor coordination plays on activities of daily living and its implications on psychosocial development and wellbeing, early identification and intervention are crucial. Remedial motor skills training would be an important preventative measure taken to avert these outcomes. Habitual motor skills training for all children would also contribute to higher levels of psychosocial adjustment overall due to the negative linear relationship found between these constructs. Our findings provide some support for the Elaborated Environmental Stress Hypothesis, however much more research is required. Further research should focus on gathering a larger sample size in order to investigate whether reported peer victimization directly mediates the relationship between motor competence and psychosocial adjustment.

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CHAPTER 3: DISCUSSION

General Discussion

The research objective outlined in this thesis was to better understand the connections between different aspects of motor, psychological, and social development. This correlational study has provided some evidence to support the ways in which a child's level of motor competence affects his or her psychosocial development. The framework that was utilized in this thesis was the Elaborated Environmental Stress Hypothesis, which postulates that the relationship between low motor competence and psychosocial adjustment problems may not be linked directly (Cairney et al. 2013). It posits that DCD acts as a primary stressor and bares children to a myriad of secondary stressors (see Figure 1). These secondary stressors can be psychosocial in nature (i.e. peer victimization, low social support, low perceived self-competence), or not (i.e. low academic performance, obesity, physical inactivity) and may place children at greater risk of internalizing problems (i.e. depression and anxiety). Therefore, the Elaborated Environmental Stress Hypothesis highlights the complexity of motor competence, its correlates, and the way in which they interact. This framework warrants much more research and is the reason for incorporating not only anxiety, depression, and loneliness into the present study but variables thought to act as secondary stressors, such as peer victimization, physical inactivity and obesity.

When this framework was developed and published, only a few studies had begun exploring other determinants of internalizing problems in children with DCD (i.e. Francis & Piek, 2003; Rigoli et al. 2012). A recent mini-review of the Elaborated Environmental Stress Hypothesis by Mancini et al. (2016a), discusses some new developments after the

initial model was proposed. Among others, they highlight the work of Viholainen et al. (2014) who concluded that self-concepts mediate the relationship between motor competence and psychosocial adjustment in adolescent girls, and the work of Wilson and colleagues (2013) who concluded that social skills mediate the relationship between motor competence and psychosocial adjustment in children ages 4 to 6. Mancini et al. (2016b) also found that perceived family support mediates this same relationship.

Although this study initially sought to test secondary stressors as mediating or moderating variables as described in the model, the sample size was not large enough to conduct this type of analysis. Instead, correlations between each motor competence and the secondary stressors, the secondary stressors and the psychosocial adjustment variables, and motor competence and the psychosocial adjustment variables were tested. The associations followed the structure laid out in the Elaborated Environmental Stress Hypothesis and looked to find where associations might exist within the framework.

In the Elaborated Environmental Stress Hypothesis, Cairney et al. (2013) describe that children with DCD often face interpersonal conflict with peers. A few studies have looked at children with DCD or probable-DCD to make a case of peer related difficulties in this population (Campbell et al. 2012; Lingam et al. 2012) although very few have looked at this relationship in normally developing children (Livesey et al. 2011). In boys, the results of the present study show that the lower a child's motor competency, the more likely they are to report being victimized by peers whereas the higher their motor competency, the less likely they are to be victimized. Self-reported peer victimization also correlated positively with generalized anxiety symptoms, obsessive-compulsive symptoms, panic disorder symptom, separation anxiety symptoms, and social phobia

symptoms for boys and depression symptoms and social phobia symptoms for girls. The present study is unable to confirm whether peer victimization is a mediating factor between low motor competency and psychosocial adjustment problems. Rather, it supports the view that additional factors could be considered within the framework and that further research could determine whether peer victimization is a mediating factor in both DCD groups and more broadly in normally developing children.

The difference between boys and girls in our sample is especially noteworthy. A significant negative correlation between self-reported peer victimization and motor competence was found in boys only. The literature is somewhat inconclusive about these gender-based variations; some indicate no difference in gender (Campbell et al. 2012), whereas others have found a more significant association in boys (Livesey et al. 2011), and some have found a more significant association in girls (Piek et al. 2005). It is commonly thought that boys place more value on sport than girls (Lee, Carter, & Xiang, 1995). For instance, Chase and Mochida (2011) reported that elementary school boys placed more importance on being good at sports than girls. This was also highlighted by Chase and Dummer (1992), who found that sports are the most important determinant of personal popularity in boys. This might explain why boys who underperform in sport, such as those in our study, report higher levels of victimization by peers.

The Elaborated Environmental Stress Hypothesis also highlights physical inactivity and obesity as a secondary stressor in the population of children with DCD (Cairney et al. 2013). The evidence to support this idea is strong given that motor competence is seen as a prerequisite to engage successfully in lifelong physical activity (Gallahue & Ozmun, 2006), which in turn regulates weight status. In a recent systematic

review, Barnett et al. (2016) point out that weight status acts differently when tested against subcategories of gross motor competence. In their review, object control skills did not correlate with weight status. Furthermore, they were not able to establish a relationship between locomotor skills and weight status. Weight status did on the other hand correlate negatively with skill composite, motor coordination, and stability. The results of the present study did not reveal any correlation between weight status and either of the gross motor competence subcategories, namely object control and locomotor skills. In line with the literature, object control skills require less movement of larger body segments, which might explain this lack of association (Okely, Booth, & Chey, 2004; Southall, Okely, & Steele, 2004). Locomotor skills, on the other hand, require moving more weight and therefore are often associated negatively with weight status (Okely et al. 2004; Southall et al. 2004). A reason that might help explain why no association was found between weight status and motor competence in the present study is the incremental accumulation of weight over time. For example, Lopes, Maia, Rodrigues, & Malina (2012) measured skinfolds longitudinally of children from the age of 6 to 10 and found that low motor competence was associated with increased adiposity over time. The present study assessed weight status and motor competence in a sample where approximately half of the child participants were ages 7 and 8. Some of these children may not have reached the point at which their level of motor competence is longstanding enough to accrue the weight that is often reported in this population. Studies do show that being overweight or obese affects motor skill acquisition (D'Hondt et al. 2013), however, if children have a functional limitation beforehand, it may lead to

subsequent reductions in physical activity, thereby increasing weight over time (Hendrix et al. 2014).

The current study found no association between motor competence and physical activity levels. This is similar to the findings of Ziviani, Poulsen, and Hansen (2009) who found little to no association between motor competence and physical activity levels in a sample of children ages 6 to 12. In contrast, findings of Lopes et al. (2011) found motor competence to be an important predictor of physical activity levels of children ages 6 to 10. Furthermore, Lubans et al. (2010) performed a systematic review and found a strong positive association between motor competence and physical activity levels. A reason that might help explain the lack of association between motor competence and physical activity in the current study is that it was limited by a parent report measure. Research shows that parents might overestimate their child's involvement in physical activity (Corder, Crespo, van Sluijs, Lopez, & Elder, 2012), which misrepresents the actual time children are spending being active. Perhaps a more objective measure such as accelerometers would have provided a more accurate measure of children's engagement in physical activity. Furthermore, the current study did not differentiate between organized and non-organized physical activity, nor did it differentiate between time and frequency spent improving object control and locomotor skills. Both of these aspects are important measures of physical activity and not differentiating between them are a limitation of this study. As explained by Holfelder & Schott (2014), organized physical activity is different from non-organized physical activity in that the activity itself is organized by coaches or trainers that are experienced and qualified to support children according to their individual needs. Organized physical activity is often associated with

improvements that can easily be seen in product-oriented assessments, which equates to process-oriented improvements. Furthermore, differentiating between object control and locomotor skills in physical activity can indicate whether the changes in skill proficiency is the result of the type of activity the children participate in (i.e. organized versus non-organized). By summing all types of physical activity together, actual differences may be masked that could otherwise show an association between specific types of physical activities and type of motor skill competency (Barnett et al. 2016).

Although this study was not able to test the direct or indirect effects of secondary stressors within the framework of the Elaborated Environmental Stress Hypothesis, it adds to the growing body of empirical research that supports the framework. To the best of our knowledge, no study has tested motor competence as it relates to peer victimization, physical activity, weight status and psychosocial adjustment problems, namely anxiety symptoms, depression symptoms and loneliness together in sample of subclinical and normally developing school-aged children. Therefore, the current study furthers the notion that the framework is complex and that additional variables should be integrated within the model to advance our understanding of the stressors that may impact motor competence. In particular, the results of this study highlight the importance of recognizing peer victimization as a secondary stressor as well as recognizing the role it plays on school-aged boys. Peer victimization can have many psychosocial consequences (Hawker & Boulton, 2000) that can be avoided if the appropriate measures are taken early in a child's development.

In a mini-review by Mancini et al. (2016a), the authors discuss the application of the Elaborated Environmental Stress Hypothesis along the full spectrum of motor skills

rather than into DCD and non-DCD groups and how it has optimized the development of the framework. Studies that have tested normative samples have found a negative linear relationship between motor competence and psychosocial adjustment, demonstrating that higher motor competence is in fact a predictor of decreased psychosocial adjustment problems (Poole et al. 2015; Wilson et al. 2013). The full spectrum of motor competence is very much understudied and for this reason, we applied the framework to a subclinical and normally developing sample of children. The results of the current study demonstrate a negative linear relationship between motor competence and many psychosocial adjustment variables as well as peer victimization, which was especially prominent in our boy's subsample. Boys reported higher levels of peer victimization, depressive symptoms, separation anxiety symptoms and social phobia symptoms as their motor competence decreased. The present study is the first to our knowledge that has reported this negative linear relationship between motor competence and peer victimization in a normally developing sample of children aged 7 to 10.

One of the key significances of this thesis is that studying motor skills along a continuum paints a global picture of a human characteristic that is distributed normally within the population. The results of this study show that motor competence, wherever it falls on the motor skill spectrum, is associated with psychosocial adjustment and peer victimization either positively or negatively. The idea that higher motor competence actually generates better psychosocial development and less peer victimization is just emerging in the literature. The results of this study would support that intervention programs target aspects of children's physical and psychosocial development. Such

programs should be universal in order to enhance the psychosocial development of all children irrespective of where they fall on the spectrum of motor competence.

Chapter 4: CONCLUSION

General Conclusions

This research study shows that low motor competence is associated with social and mental health outcomes not only restricted to clinical populations. In fact, this research builds on others that have suggested a negative linear relationship between motor skills and mental and social outcomes providing further evidence that low motor competence is closely linked to poor psychosocial development and that higher motor competence is associated with better psychosocial development. These types of findings indicate that all children, no matter their level of motor competence, would benefit greatly from learning motor-based skills early, which in turn will contribute to children acquiring the physical literacy they need to lead a healthy life. Like all research, there are a number of additional questions that need to be answered. The following are some suggestions for future research:

1. This research should be replicated on a bigger sample to add to the existing data. A larger sample size will give the researchers the ability to test mediating variables and provide further evidence for secondary stressors.
2. More research should be conducted to better understand the differences between males and females in this domain. Are males more psychosocially affected by their motor competence than girls?
3. Longitudinal studies in this area are limited. The few studies that do exist provide support of a causal relationship between low motor competence and later psychosocial adjustment problems. Certainly, more research is required to take

into account other risk factors that could potentially link motor impairments and psychosocial adjustment problems.

4. The evidence that suggests a pathway between early motor problems and future psychosocial adjustment problems via secondary stressors is strong. To prevent these, perhaps consideration should be put toward building positive pathways to support resilience and motor skill improvement (Missiuna, Polatajko, & Pollock, 2015).

The impact of motor competence on the lives of children is profound. Children must be supported throughout the early years of development into middle and late childhood in order to build a strong foundation for lifelong motor development and prevent the poor mental and social outcomes that often co-occur in children with low motor competence. Schools, homes, and communities must work together to create supportive environments that reinforce healthy and timely motor development.

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Appendices

Appendix 1. *Laurentian University Ethics Board Approval Letter*

LaurentianUniversity
UniversitéLaurentienne

APPROVAL FOR CONDUCTING RESEARCH INVOLVING HUMAN SUBJECTS
Research Ethics Board – Laurentian University

This letter confirms that the research project identified below has successfully passed the ethics review by the Laurentian University Research Ethics Board (REB). Your ethics approval date, other milestone dates, and any special conditions for your project are indicated below.

TYPE OF APPROVAL / New / Modifications to project / Time extension

Name of Principal Investigator and school/department	Moriah Thorpe, supervisors, Line Tremblay, Brahim Chebbi and Céline Larivière, Human Kinetics
Title of Project	Poor motor skills, psychosocial maladjustment and the mediating role of peer victimization in early grade school children
REB file number	2015-03-05
Date of original approval of project	April 20, 2015
Date of approval of project modifications or extension *(if applicable)*	
Final/Interim report due on: *(You may request an extension)*	April, 2016
Conditions placed on project	

During the course of your research, no deviations from, or changes to, the protocol, recruitment or consent forms may be initiated without prior written approval from the REB. If you wish to modify your research project, please refer to the Research Ethics website to complete the appropriate REB form.

All projects must submit a report to REB at least once per year. If involvement with human participants continues for longer than one year (e.g. you have not completed the objectives of the study and have not yet terminated contact with the participants, except for feedback of final results to participants), you must request an extension using the appropriate LU REB form. In all cases, please ensure that your research complies with Tri-Council Policy Statement (TCPS). Also, please quote your REB file number on all future correspondence with the REB office.

Congratulations and best wishes in conducting your research.

Rosanna Langer

Rosanna Langer, PHD, Chair, *Laurentian University Research Ethics Board*

Appendix 2. *Parental Invitation Letter (English Version)*

Dear parents of 7 to 10 year olds,

My name is Moriah Thorpe and I am a Master's student at Laurentian University working under the supervision of Line Tremblay, PhD., C. Psych. I am currently studying the impact of motor skills and physical activity on children's emotions and peer relationships. My research is part of a bigger project on motor skill competence in children.

You and your child are invited to participate in this research study. Your participation will include a questionnaire on your child's involvement in physical activity and a socio-demographic questionnaire. Your child's participation will include a fun physical activity test, physical measurements (height and weight), and questionnaires on anxiety, depression, loneliness and peer relationships. These will take place at your child's school for approximately one hour. While we understand that your time is valuable, we strongly believe that the research being conducted is exceptionally important because it will contribute to the development of programs for children of this age.

All of the information that you and your child provide will be treated with the utmost care and confidentiality. Your names will not be associated with the data collected. Yours and your child's participation is voluntary and you can withdraw from the project at any time.

As passionate researchers, we want to assure you that the benefits to you and the bigger community are worth every effort in this project. If there is anything I can do to make it easier for you to participate, or to clarify any of the above information, please email Moriah at ms_thorpe@laurentian.ca or call Dr. Line Tremblay at 705-675-1151 x 4245. You may also call the Laurentian University Ethics Committee at **705-675-1151 x 2436 or toll free at 1-800-461- 4030 or by email at ethics@laurentian.ca** regarding possible ethical issues or complaints. As part of the study, a summary of the findings will become available in May 2016 but individual test results will not be reported to anyone, including parents, due to confidentiality. I thank you for your consideration in participating in this study and look forward to speaking with you soon.

Moriah Thorpe
Masters in Human Kinetics Candidate
Laurentian University

If you agree to participate, please fill out and sign the information below. An envelope with pertaining documents will follow this letter.

_____ _____

Your signature **Date**

_____ _____

Your name (printed) **Your child's name (printed)**

Appendix 3. *Parental Invitation Letter (French Version)*

Chers parents d'enfants de 7 à 10 ans,

Je m'appelle Moriah Thorpe et je suis une étudiante à la maitrise à l'Université Laurentienne. Je travaille sous la supervision de Line Tremblay, PhD., C. Psyc. Ma recherche porte sur l'impact de la motricité et l'activité physique des enfants sur leurs émotions et leurs relations avec leurs pairs. Ma recherche fait partie d'un projet plus vaste sur la compétence motrice chez les enfants.

Vous et votre enfant êtes invités à participer à cette étude. Votre participation comportera un questionnaire sur la participation de votre enfant à l'activité physique et un questionnaire sociodémographique. La participation de votre enfant inclura un test d'activité physique amusant, des mesures physiques (taille et poids), et des questionnaires sur l'anxiété, la dépression, la solitude et les relations avec les pairs. Les tests de votre enfant auront lieu à son école et dureront environ une heure. Nous comprenons que votre temps est précieux, toutefois, nous croyons fermement que cette recherche est exceptionnellement importante, car elle contribuera à l'élaboration de programmes pour les enfants de l'âge de votre enfant.

Toutes les informations que vous et votre enfant fournirez seront traitées avec le plus grand soin et avec confidentialité. Vos noms ne seront pas associés aux données recueillies. Votre participation et celle de votre enfant sont volontaires et vous pouvez vous retirer du projet n'importe quand.

En tant que chercheurs passionnés, nous tenons à vous assurer que les avantages pour vous et pour la communauté en général valent tous les efforts dans ce projet. Si vous avez des questions ou des préoccupations relatives à votre décision de participer, ou souhaitez clarifier l'une des informations présentées plus haut, n'hésitez pas à communiquer avec moi, Moriah Thorpe à l'adresse courriel suivante : ms_thorpe@laurentienne.ca ou appeler Dre Line Tremblay au 705-675-1151, poste 4245. Vous pouvez également communiquer avec le comité éthique de l'Université Laurentienne au **705-675-1151, poste 2436 ou sans frais au 1-800-461- 4030 ou par courriel à ethics@laurentienne.ca** . Dans le cadre de l'étude, un résumé des résultats sera disponible à la fin de notre étude, mais les résultats des tests individuels ne seront pas communiqués, y compris les parents, en raison de la confidentialité. Je vous remercie de considérer une participation à cette étude. En espérant vous rencontrer bientôt,

Moriah Thorpe
Candidate de maitrise en kinésie humaine
Université Laurentienne

Si vous acceptez de participer, s'il vous plaît remplir et signer le formulaire ci-dessous. Une enveloppe avec les documents pertinents suivra cette lettre.

_____	_____
Votre signature	**Date**
_____	_____
Votre nom (imprimé)	**Nom de l'enfant (imprimé)**

Appendix 4. *Consent Form (English Version)*

Study Title: Poor Gross Motor Skills, Psychosocial Maladjustment and the Mediating Role of Peer Victimization in Early Grade School Children

Researchers: Main Investigator: Moriah Thorpe, B.E.P.S. Masters Candidate, School of Human Kinetics
Co-investigator: Line Tremblay, Ph.D., C.Psych., Associate Dean, Faculty of Health
Co-investigator: Brahim Chebbi, Ph.D., Associate Professor, Bharti School of Engineering
Co-investigator: Céline Larivière, Ph.D., Associate Professor, School of Human Kinetics

I, (please print your name) _____ agree to participate in the study being conducted by Moriah Thorpe, Masters of Human Kinetics student, under the supervision of Line Tremblay, PhD, C. Psych., researching the impact of motor skills, weight and physical activity on children's emotions and peer relationships. The results of this study are expected not only to enhance our understanding the role physical activity plays on emotions and peer relationships but on raising awareness and furthering our pursuit in initiating and developing intervention strategies that will identify and safeguard children with low physical activity competence.

I also consent to have my child (please print your child's name) _____ participate in the study. I am aware that my child's participation will involve filling out questionnaires on anxiety, depression, loneliness and peer relationships, having their motor skills measured and having their height and weight measured at the school that my child attends under supervised conditions, for a period of approximately 1 hour. I am also aware that I will complete a socio-demographic questionnaire as well as a questionnaire on my child's participation in physical activity. I understand that the process of completing the questionnaires may cause slight fatigue and/or anxiety. I am aware that if my child shows any signs of distress during the session, the researcher will stop the session immediately and that my child will be free to return to their normal class activities. Although this study does not involve the identification of a clinical problem, if it so happens that the researcher identifies significant psychosocial distress in a child, the school psychologist and myself, the parent, will immediately be informed.

I understand that my own, and my child's participation is completely voluntary, that I may withdraw my consent, and consent for my child, to participate at any time, that all information that I provide to the researcher will be kept confidential and that my identity will not be revealed at any time. I am also aware that my child may withdraw consent to participate at any time and that the information given by my child will be treated in the same manner as my own information. Finally, I am aware that the data collected will be locked in a file cabinet in Dr. Line Tremblay's office at Laurentian University for a period of five (5) years.

_____ _____
Your signature **Date**

_____ _____
Your name (printed) **Your child's name (printed)**

If I have any questions or concerns about the study or about participating in the study, I can email the researcher (Moriah Thorpe) at ms_thorpe@laurentian.ca or call Line Tremblay, PhD., C. Psych at 705-675-1151 x 4245. **I may also contact the research ethics officer, who is not attached to the research team, regarding possible ethical issues or complaints about the research itself at 705-675-1151 x 2436 or toll free at 1-800-461- 4030 or by email at ethics@laurentian.ca.**

Appendix 5. *Consent Form (French Version)*

Titre de l'étude : Difficultés motrices, problèmes psychosociaux et la victimisation par les pairs chez les enfants d'âge scolaire

Chercheur(s) : Principal : Moriah Thorpe, B.E.P.S., Candidate de maitrise, École des sciences de l'activité physique Co-investigateur : Line Tremblay, Ph.D., C.Psyc., Doyenne associée, Faculté de la santé/Faculté de l'éducation
Co-investigateur : Brahim Chebbi, Ph.D., Professeur agrégé, École de génie Bharti
Co-investigateur : Céline Larivière, Ph.D., Professeure agrégée, École des sciences de l'activité physique

Je, (s.v.p inscrire votre nom) _____, accepte de participer à l'étude conduite par Moriah Thorpe (étudiante de maitrise en kinésie humaine à l'Université Laurentienne, sous la supervision de Line Tremblay, Ph.D., C.Psyc.) qui porte sur l'impact des difficultés motrices, le poids et l'activité physique des enfants sur les émotions et les relations entre les pairs. Les résultats de cette étude visent non seulement à améliorer notre compréhension des liens entre l'activité physique, les émotions et les relations avec les pairs, mais permettra de développer des stratégies d'intervention qui permettront d'identifier et de protéger les enfants à faibles compétences motrices.

J'accepte aussi que mon enfant (s.v.p. inscrire le nom de votre enfant) _____ participe à l'étude. Je suis au courant que la participation de mon enfant implique de remplir des questionnaires sur l'anxiété, la dépression, la solitude et les relations avec les pairs. Elle implique aussi la mesure de ses habiletés motrices, de son poids et de sa taille. Tous les tests seront effectués sous supervision pour une période d'environ une heure. Je suis également conscient que je vais remplir un questionnaire sociodémographique et un questionnaire sur la participation de mon enfant à l'activité physique. Je comprends que le processus pourrait causer une légère fatigue et/ou de l'anxiété. Je suis conscient que si mon enfant présente des signes de détresse au cours de la session, la chercheuse arrêtera immédiatement la session et mon enfant sera libre de retourner à ses activités normales. Bien que cette étude n'implique pas l'identification d'un problème clinique, s'il se trouve que la chercheuse identifie de la détresse psychosociale importante chez un enfant, le psychologue de l'école et moi-même, le parent, seront immédiatement informés.

Je comprends que ma participation, et celle de mon enfant, sont complètement volontaires, que je peux retirer mon consentement ou celui de mon enfant n'importe quand, que toute information que je fournis aux chercheurs est confidentielle et que mon identité ne sera révélée à aucun temps. Je suis également conscient que mon enfant peut retirer son consentement de participer n'importe quand et que l'information donnée par mon enfant sera traitée de la même manière que la mienne. Finalement, je suis conscient que les données collectées seront conservées dans un classeur sous verrous dans le laboratoire de Dre Line Tremblay à l'Université Laurentienne pour une période de cinq (5) ans.

_____	_____
Votre signature	**Date**
_____	_____
Votre nom (imprimé)	**Nom de l'enfant (imprimé)**

Si j'ai des questions ou des inquiétudes au sujet de cette étude ou au sujet de ma participation à cette étude, je peux envoyer un courriel à la chercheuse (Moriah Thorpe) à ms_thorpe@laurentienne.ca ou appeler Line Tremblay, Ph.D., C.Psyc. au 705-675-1151 poste 4245. **Je peux aussi communiquer avec le comité éthique de l'Université Laurentienne, qui n'est pas attaché à l'équipe de recherche, si j'ai des préoccupations d'ordre éthique ou des plaintes concernant la recherche à 705-675-1151 poste 2436 ou sans frais à 1-800-461- 4030 ou par courriel à ethics@laurentienne.ca.**

Appendix 6. *Physical Activity Readiness Questionnaire (English Version)*

PHYSICAL ACTIVITY READINESS QUESTIONNAIRE FOR CHILDREN

To be completed by the parent or legal guardian of the child

Child's Name: _____ Child's Date of Birth: _____/_____/_____

Your child will be asked to perform a fun physical activity test. The activities include running, jumping, galloping, skipping, hopping, sliding, striking a baseball, striking a tennis ball, dribbling, catching, kicking, throwing and rolling.

Please complete the following by **circling YES** or **NO**.

1. Have the test procedures been fully explained to you? Y / N
2. Has your family doctor or a paediatrician ever said that your child has a medical condition and that your child should only do physical activity recommended by a doctor? Y / N
3. Does your child have uncontrolled asthma (i.e. asthma that is not easily controlled by an inhaler?) Y / N
4. Does your child have a bone or joint problem that could be made worse by a change in their physical activity participation? Y / N
5. Is your doctor currently prescribing any medication for your child's health condition? Y / N
6. Do you know any other reason why your child should not undergo physical activity? This might include diabetes, a recent injury or serious illness. Y / N

If you have answered **NO** to questions **2 to 5** then you can be reasonably sure that your child can take part in the physical activity requirement of this project.

I, (please print your name) _____ declare that the above information is correct at the time of completing this questionnaire on date _____/_____/_____

Signature of Parent/Guardian: _____

Please note: If your child's health changes so that you can answer YES to any of the above questions, notify the investigators and consult with your doctor regarding the level of physical activity that your child can participate in.

I understand that my own, and my child's participation is completely voluntary and that I may withdraw my consent, and consent for my child, to participate at any time. I am also aware that my child can withdraw his or her consent at any time. If I have any questions or concerns about the study or about participating in the study, I can email the researcher (Moriah Thorpe) at ms_thorpe@laurentian.ca or call Line Tremblay, PhD., C. Psych at (705) 675-1151 x 4245. **I may also contact the research ethics officer, who is not attached to the research team, regarding possible ethical issues or complaints about the research itself at (705) 675-1151 x 2436 or toll free at 1-800-461- 4030 or by email at ethics@laurentian.ca.**

Appendix 7. *Physical Activity Readiness Questionnaire (French Version)*

QUESTIONNAIRE SUR L'APTITUDE À L'ACTIVITÉ PHYSIQUE POUR ENFANTS

À remplir par le parent ou tuteur de l'enfant

Nom de l'enfant : _____ Date de naissance : _____/_____/_____

Votre enfant sera invité à effectuer un test d'activité physique amusant. Les activités comprennent la course, des sauts, du galop, de la glissade sur ses pieds, ainsi que de frapper une balle de baseball, frapper une balle de tennis, dribbler, attraper, botter, lancer et rouler.

Veuillez remplir la section suivante en **encerclant <u>OUI</u>** ou **<u>NON</u>**.

1. Est-ce que les procédures du test ont été pleinement expliquées pour vous ? O / N
2. Est-ce que votre médecin ou un pédiatre vous a déjà dit que votre enfant a un problème de santé et qu'il ou elle devrait seulement faire de l'activité physique recommandée par un médecin ? O / N
3. Est-ce que votre enfant souffre d'asthme non-contrôlé (par exemple de l'asthme qui n'est pas facilement contrôlée par un inhalateur ?) O / N
4. Est-ce que votre enfant a un problème osseux ou articulaire qui pourrait être aggravé par une modification de sa participation à l'activité physique ? O / N
5. En ce moment, est-ce que votre médecin prescrit des médicaments pour l'état de santé de votre enfant ? O / N
6. Connaissez-vous une autre raison pour laquelle votre enfant ne devrait pas se soumettre à de l'activité physique ? Cela pourrait inclure le diabète, une blessure récente ou une maladie grave O / N

Si vous avez répondu **NON** aux questions **<u>2 à 5</u>**, vous pouvez être raisonnablement sûr que votre enfant peut participer aux exigences d'activité physique de ce projet.

Je, (s.v.p. imprimer votre nom) _____ déclare que les informations ci-dessus sont exactes au moment de remplir ce questionnaire à la date _____ / _____ /_____

Signature du parent/tuteur : _____

N.B.: Si la santé de votre enfant change de manière à ce que vous puissiez répondre OUI à l'une des questions ci-dessus, s'il vous plaît aviser les chercheurs et consulter votre médecin au sujet du niveau d'activité physique que votre enfant peut accomplir.

Je comprends que ma participation, et celle de mon enfant, sont complètement volontaires, que je peux retirer mon consentement ou celui de mon enfant n'importe quand. Si j'ai des questions ou des inquiétudes au sujet de cette étude ou au sujet de ma participation à cette étude, je peux envoyer un courriel à la chercheuse (Moriah Thorpe) à <u>ms_thorpe@laurentienne.ca</u> ou appeler Line Tremblay, Ph.D., C.Psyc. au (705) 675-1151 poste 4245. **Je peux aussi communiquer avec le comité éthique de l'Université Laurentienne, qui n'est pas attaché à l'équipe de recherche, si j'ai des préoccupations d'ordre éthique ou des plaintes à formuler au sujet de cette recherche à (705) 675-1151 poste 2436 ou sans frais à 1-800-461- 4030 ou par courriel à ethics@laurentienne.ca**

Appendix 8. *Sociodemographic Questionnaire (English Version)*

SOCIODEMOGRAPHIC QUESTIONNAIRE

To be completed by one parent who lives with the child participating in this study, at the child's primary residence

1. Indicate the date that you completed this questionnaire.

_____/_____/_____
day month year

2. Who is the person completing this questionnaire?

___ Mother (Biological / Other)
___ Father (Biological / Other)
___ Other (specify) _____

The following questions are about the child participating in this study.

3. Child's date of birth _____/_____/_____
day month year

4. Your date of birth _____/_____/_____
day month year

5. Sex of child Male / Female (please circle one)

6. Child's cultural background _____

7. Compared to children who are the same age, would you say your child is in generally good health?

_____yes
_____no

8. What is your child's weight (you may answer in either pounds or kilograms)?

_____ pounds
_____ kilograms
_____ do not know

9. What is your child's height (you may answer in either feet or centimeters)?

_____ centimeters

_____ feet inches
_____ do not know

The following questions are about the family member that lives with the child.

10. What is your marital status?

_____ single
_____ married
_____ separated
_____ divorced
_____ widowed

11. What is your approximate household income?

_____0- $15 000
_____$15 000 -$30 000
_____$30 000 - $45 000
_____$45 000 - $60 000
_____$60 000 - $75 000
_____$75 000 -$100 000
_____over $100 000

12. What is your highest level of education?

_____Some elementary
_____Some secondary
_____Completed secondary
_____College/Trade School
_____Some University
_____Completed University
_____University Master's degree
_____Graduated with Doctorate
_____Graduated with Professional Designation
_____Do not know
_____Does not apply

13. Your sex: _____Male
_____Female

Appendix 9. *Sociodemographic Questionnaire (French Version)*

QUESTIONNAIRE SOCIODÉMOGRAPHIQUE

Doit être rempli par un parent qui vit avec l'enfant participant à cette étude, à la résidence principale de l'enfant

1. Indiquer la date à laquelle vous avez rempli ce questionnaire.

_____/_____/_____
jour mois année

2. Qui est la personne qui a rempli ce questionnaire ?

_____ Mère (biologique / autre)
_____ Père (biologique / autre)
_____ Autre (précisez) _____

Les questions suivantes portent sur l'enfant qui participe à cette étude.

3. Date de naissance de l'enfant _____/_____/_____
jour mois année

4. Votre date de naissance _____/_____/_____
jour mois année

5. Sexe de l'enfant masculin / féminin (encercler)

6. Ascendance culturelle de l'enfant _____

7. Comparativement aux enfants qui ont le même âge de votre enfant, diriez-vous que votre enfant est en bonne santé générale ?

_____oui
_____non

8. Quel est le poids de votre enfant (vous pouvez répondre en livres ou en kilogrammes) ?

_____ lbs
_____ kg
_____ je ne sais pas

9. Quel est la taille de votre enfant (vous pouvez répondre en centimètres ou en pouces) ?

_____ centimètres

_____ pieds _____ pouces
_____ je ne sais pas

Les questions suivantes portent sur le membre de la famille qui vit avec l'enfant.

10. Quel est votre statut marital ?

_____ célibataire
_____ marié(e)
_____ séparé(e)
_____ divorcé(e)
_____ veuve (veuf)

11. Quel est le revenu par année de l'ensemble de votre famille ?

_____ 0 - 15 000 $
_____ 15 000$ - 30 000$
_____ 30 000$ - 45 000$
_____ 45 000$ - 60 000$
_____ 60 000$ - 75 000$
_____ 75 000$ - 100 000$
_____ 100 000$ et plus

12. Quel est votre niveau d'éducation ?

_____ Élémentaire
_____ Secondaire
_____ Gradué du secondaire
_____ Collège ou Cégep
_____ Université
_____ Gradué d'université avec baccalauréat
_____ Gradué d'université avec maîtrise
_____ Gradué d'université avec doctorat
_____ Gradué d'université avec désignation professionnelle (ex : avocat)
_____ Je ne sais pas
_____ Ne s'applique pas

13. Votre sexe: _____ Homme
_____ Femme

Appendix 10. *Physical Activity Questionnaire for Parent (English Version)*

PHYSICAL ACTIVITY QUESTIONNAIRE FOR PARENT

Please read each question carefully before answering. Please circle **one number for each question**, which best corresponds to your answer about the child participating in our study.

---

1. Please rate your child's physical activity level, which may include activities such as sports, playing tag, or climbing on a gym set, during the following times of day:

a) before breakfast

1	2	3	4	5
not at all active	slightly active	moderately active	very active	highly active

b) morning

1	2	3	4	5
not at all active	slightly active	moderately active	very active	highly active

c) early afternoon

1	2	3	4	5
not at all active	slightly active	moderately active	very active	highly active

d) late afternoon

1	2	3	4	5
not at all active	slightly active	moderately active	very active	highly active

e) after dinner

1	2	3	4	5
not at all active	slightly active	moderately active	very active	highly active

2. Please rate your child's physical activity level compared to other children who are the **same gender** as the child participating in this study.

1	2	3	4	5
not at all active	slightly active	moderately active	very active	highly active

3. Please rate your child's physical activity level compared to other children who are the **same gender and age** as your child.

1	2	3	4	5
not at all active	slightly active	moderately active	very active	highly active

4. Please read the following passage and compare your child's physical activity level to the child in the passage who is the **same gender** as your child.

Sam/Sally is a quiet child who enjoys reading, watching cartoons and doing puzzles.

1	2	3	4	5
not at all similar	slightly similar	moderately similar	very similar	highly similar

5. Please read the following passage and compare your child's physical activity level to the child in the passage who is the **same gender** as your child.

Joe/Jill is an excited child who enjoys playing sports, playing outside and swimming.

1	2	3	4	5
not at all similar	slightly similar	moderately similar	very similar	highly similar

6. Please rate the overall health of your child.

1	2	3	4	5
very poor	poor	good	very good	excellent

7. Please rate the overall health of your child compared to other children who are the **same gender and age** as your child.

1	2	3	4	5
very poor	poor	good	very good	excellent

8. How concerned are you about your child's current weight?

1	2	3	4	5
unconcerned	slightly unconcerned	neutral	slightly concerned	concerned

9. Please indicate the total time (on average) that your child is involved in exercise activities (e.g. sports activities) and physically active play (e.g. playing tag or climbing on a gym set) each day.

_____less than 30 minutes per day

_____30 to 60 minutes per day

_____60 to 120 minutes per day

_____120 minutes or more per day

10. Please indicate the total time (on average) that your child engages in television/video viewing?

_____hours per day

11. When does your child usually go to bed during the week?

_____(time)

12. When does your child usually get up in the morning during the week?

_____(time)

13. How long does your child typically nap on average during a weekday?

_____child does not nap during the day OR _____minutes

For the following questions, please circle **one number for each question**, which best corresponds to your answer.

During a typical week how often has a member of your household:
(circle one number for each type of person)

14. Encouraged the child participating in our study to do physical activities or play sports?

	none	once	sometimes	almost daily	daily	don't know	not applicable
a. male adult(s)	0	1	2	3	4	5	6
b. female adult(s)	0	1	2	3	4	5	6
c. other children	0	1	2	3	4	5	6

15. Done a physical activity or played sports with the child in our study?

	none	once	sometimes	almost daily	daily	don't know	not applicable
a. male adult(s)	0	1	2	3	4	5	6
b. female adult(s)	0	1	2	3	4	5	6
c. other children	0	1	2	3	4	5	6

16. Provided transportation so the child in our study can go to a place where he/she can do physical activities or play sports?

	none	once	sometimes	almost daily	daily	don't know	not applicable
a. male adult(s)	0	1	2	3	4	5	6
b. female adult(s)	0	1	2	3	4	5	6
c. other children	0	1	2	3	4	5	6

17. Watched the child in our study participate in physical activities or sports?

	none	once	sometimes	almost daily	daily	don't know	not applicable
a. male adult(s)	0	1	2	3	4	5	6
b. female adult(s)	0	1	2	3	4	5	6

c. other children	0	1	2	3	4	5	6

18. Told the child in our study that physical activity is good for his/her health?

	none	once	sometimes	almost daily	daily	don't know	not applicable
a. male adult(s)	0	1	2	3	4	5	6
b. female adult(s)	0	1	2	3	4	5	6
c. other children	0	1	2	3	4	5	6

19. How important is it to adults in your household that this child is good at sports and physical activities?

	very unimportant	somewhat unimportant	neutral	somewhat important	very important	not applicable
a. male adult(s)	1	2	3	4	5	6
b. female adult(s)	1	2	3	4	5	6

20. How much do the adults in your family enjoy physical activity or exercise?

	very unimportant	somewhat unimportant	neutral	somewhat important	very important	not applicable
a. male adult(s)	1	2	3	4	5	6
b. female adult(s)	1	2	3	4	5	6

21. How many days in the past week did the adults in your household walk for exercise?

a. myself	0	1	2	3	4	5	6	7	not applicable
b. other adult female	0	1	2	3	4	5	6	7	not applicable
c. other adult male	0	1	2	3	4	5	6	7	not applicable

22. On how many of the past 7 days did adults in your household do heavy house cleaning, gardening, or yard work for at least 20 minutes at a time?

a. myself _____days in past week
b. other adult female _____days in past week
c. other adult male _____days in past week

23. On how many of the past 7 days did adults in your household exercise or participate in sports activities for at least 20 minutes that made you sweat and breathe hard, such as basketball, jogging, swimming laps, tennis, fast bicycling, or similar aerobic activities?

a. myself _____times per week
b. other adult female _____times per week
c. other adult male _____times per week

Appendix 11. *Physical Activity Questionnaire for Parent (French Version)*

QUESTIONNAIRE D'ACTIVITÉ PHYSIQUE POUR PARENTS

Veuillez lire attentivement chaque question avant d'y répondre. S'il vous plaît **encerclez un chiffre** pour chaque question qui correspond le mieux à votre réponse au sujet de l'enfant participant à l'étude.

---

1. Indiquez le niveau d'activité physique de votre enfant, ce qui peut inclure des activités telles que le sport, jouer à « tag » ou de grimper sur un ensemble de gymnase pour enfants, au cours des moments de la journée :

a) avant de déjeuner

1	2	3	4	5
pas du tout actif	peu actif	modérément actif	très actif	extrêmement actif

b) matin

1	2	3	4	5
pas du tout actif	peu actif	modérément actif	très actif	extrêmement actif

c) début après-midi

1	2	3	4	5
pas du tout actif	peu actif	modérément actif	très actif	extrêmement actif

d) tard l'après-midi

1	2	3	4	5
pas du tout actif	peu actif	modérément actif	très actif	extrêmement actif

e) après le souper

1	2	3	4	5
pas du tout actif	peu actif	modérément actif	très actif	extrêmement actif

2. Indiquez le niveau d'activité physique de votre enfant par rapport à d'autres enfants du **même sexe** que votre enfant.

1	2	3	4	5
pas du tout actif	peu actif	modérément actif	très actif	extrêmement actif

3. S'il vous plaît cotez le niveau d'activité physique de votre enfant par rapport à d'autres enfants du **même sexe et du même âge** que votre enfant.

1	2	3	4	5

pas du tout actif	peu actif	modérément actif	très actif	extrêmement actif

4. Veuillez indiquer si le niveau d'activité physique de votre enfant est le même que celui décrit dans le passage suivant (comparez à un enfant de **même sexe** que votre enfant).

Sam/Sally est un enfant calme, qui aime la lecture, regarder des dessins animés et faire des casses-têtes.

1	2	3	4	5
pas du tout semblable	peu semblable	modérément semblable	très semblable	extrêmement semblable

5. Veuillez indiquer si le niveau d'activité physique de votre enfant est le même que celui décrit dans le passage suivant (comparez à un enfant de **même sexe** que votre enfant).

Joe/Jill est un enfant excité qui aime jouer aux sports, jouer dehors et faire de la natation.

1	2	3	4	5
pas du tout semblable	peu semblable	modérément semblable	très semblable	extrêmement semblable

6. Veuillez indiquer le niveau de santé globale de votre enfant.

1	2	3	4	5
très faible	faible	bonne	très bonne	excellente

7. Veuillez indiquer le niveau de santé globale de votre enfant par rapport à d'autres enfants du **même sexe** et du **même âge** de votre enfant.

1	2	3	4	5
très faible	faible	bonne	très bonne	excellente

8. Comment inquièt(e) êtes-vous au sujet du poids actuel de votre enfant ?

1	2	3	4	5
pas inquièt(e)	un peu inquièt(e)	neutre	assez inquièt(e)	inquièt(e)

9. Veuillez indiquer le nombre total d'heures (en moyenne) que votre enfant passe à faire de l'exercice physique (par exemple, des activités sportives) et des jeux impliquant de l'activité physique (par exemple, jouer « tag » ou jouer sur un ensemble de gymnase pour enfants) chaque jour.

_____moins de 30 minutes par jour

_____de 30 à 60 minutes par jour

_____de 60 à 120 minutes par jour

_____120 minutes ou plus par jour

10. Veuillez indiquer le nombre total d'heures (en moyenne) que votre enfant visionne la télévision/des films.

_____heures par jour

11. À quelle heure est-ce que votre enfant se couche, en général, au cours de la semaine ?

_____(heure)

12. Quand est-ce que votre enfant se réveille, en général, le matin au cours de la semaine ?

_____(heure)

13. Combien de temps dure une sieste, en général, pendant les jours de la semaine ?

_____enfant ne fait pas de sieste pendant la journée OU _____minutes

Pour les questions suivantes, s'il vous plaît encerclez **un chiffre pour chaque question** qui correspond le mieux à votre réponse.

Au cours d'une semaine typique, combien de fois un membre de votre ménage :
(encerclez un chiffre pour chaque type de personne)

14. Encourage l'enfant participant à notre étude à faire des activités physiques ou jouer à des sports ?

	jamais	une fois	parfois	presqu'à chaque jour	à chaque jour	ne sait pas	ne s'applique pas
a. adulte(s) masculin(s)	0	1	2	3	4	5	6
b. adulte(s) féminin(s)	0	1	2	3	4	5	6
c. autres enfant(s)	0	1	2	3	4	5	6

15. A fait une activité physique ou a joué à un sport avec l'enfant participant à notre étude?

	jamais	une fois	parfois	presqu'à chaque jour	à chaque jour	ne sait pas	ne s'applique pas
a. adulte(s) masculin(s)	0	1	2	3	4	5	6
b. adulte(s) féminins(s)	0	1	2	3	4	5	6
c. autres enfant(s)	0	1	2	3	4	5	6

16. A fournit un moyen de transport afin que l'enfant participant à notre étude puisse se rendre à un endroit où il/elle participe à des activités physiques ou sportives ?

	jamais	une fois	parfois	presqu'à chaque jour	à chaque jour	ne sait pas	ne s'applique pas
a. adulte(s) masculin(s)	0	1	2	3	4	5	6
b. adulte(s) féminins(s)	0	1	2	3	4	5	6
c. autres enfant(s)	0	1	2	3	4	5	6

17. A visionné l'enfant participant à notre étude en train de participer à des activités physiques ou sportives ?

	jamais	une fois	parfois	presqu'à chaque jour	à chaque jour	ne sait pas	ne s'applique pas
a. adulte(s) masculin(s)	0	1	2	3	4	5	6
b. adulte(s) féminins(s)	0	1	2	3	4	5	6
c. autres enfant(s)	0	1	2	3	4	5	6

18. A dit à l'enfant participant à notre étude que l'activité physique est bonne pour sa santé ?

	jamais	une fois	parfois	presqu'à chaque jour	à chaque jour	ne sait pas	ne s'applique pas
a. adulte(s) masculin(s)	0	1	2	3	4	5	6
b. adulte(s) féminins(s)	0	1	2	3	4	5	6
c. autres enfant(s)	0	1	2	3	4	5	6

19. Quelle est l'importance pour les adultes de votre famille que cet enfant soit bon dans les sports et dans les activités physiques ?

	aucunement important	un peu important	neutre	assez important	très important	ne s'applique pas
a. adulte(s) masculin(s)	1	2	3	4	5	6
b. adulte(s) féminins(s)	1	2	3	4	5	6

20. Jusqu'à quel point les adultes de votre famille apprécient l'activité physique ou de l'exercice ?

	pas du tout	un peu	incertain(e)	modérément	beaucoup	ne s'applique pas
a. adulte(s) masculin(s)	1	2	3	4	5	6
b. adulte(s) féminins(s)	1	2	3	4	5	6

21. Combien de jours au courant de la semaine passée est-ce que les adultes de votre ménage ont marché en but de faire de l'exercice ?

a. moi-même	0	1	2	3	4	5	6	7	not applicable
b. autre(s) femme(s) adulte(s)	0	1	2	3	4	5	6	7	not applicable
c. autre(s) homme(s) adulte(s)	0	1	2	3	4	5	6	7	not applicable

22. Combien de jours de la semaine (7 jours) dernière les adultes de votre famille ont effectué des tâches ménagères importantes, ont jardiné ou ont travaillé à l'extérieur de la maison pour une durée d'au moins 20 minutes sans arrêt ?

a. moi-même _____ jours dans la dernière semaine
b. autre(s) femme(s) adulte(s) _____ jours dans la dernière semaine
c. autre(s) homme(s) adulte(s) _____ jours dans la dernière semaine

23. Combien de jours par semaine (7 jours) les adultes de votre famille participent à des activités sportives intenses, qui mène à la transpiration et la respiration accélérée, pour au moins 20 minutes (par exemple au ballon panier, natation, tennis, bicyclette rapide ou des activités aérobies similaires) ?

a. moi-même _____fois par semaine
b. autre(s) femme(s) adulte(s) _____ fois par semaine
c. autre(s) homme(s) adulte(s) _____fois par semaine

Appendix 12. *Loneliness and Social Dissatisfaction Scale (English Version)*

LONELINESS AND SOCIAL DISSATISFACTION SCALE

1. Is it easy for you to make new friends at school?

Yes *Sometimes* *No*

2. Do you like to read?*

Yes *Sometimes* *No*

3. Do you have other kids to talk to at school?

Yes *Sometimes* *No*

4. Are you good at working with other kids at school?

Yes *Sometimes* *No*

5. Do you watch TV a lot?*

Yes *Sometimes* *No*

6. Is it hard for you to make friends at school?**

Yes *Sometimes* *No*

7. Do you like school?*

Yes *Sometimes* *No*

8. Do you have lots of friends at school?

Yes *Sometimes* *No*

9. Do you feel alone at school?**

Yes *Sometimes* *No*

10. Can you find a friend when you need one?

Yes *Sometimes* *No*

11. Do you play sports a lot?*

Yes *Sometimes* *No*

12. Is it hard to get kids in school to like you?**

Yes *Sometimes* *No*

13. Do you like science?*

Yes *Sometimes* *No*

14. Do you have kids to play with at school?

Yes *Sometimes* *No*

15. Do you like music?*

Yes *Sometimes* *No*

16. Do you get along with other kids at school?

Yes *Sometimes* *No*

17. Do you feel left out of things at school?**

Yes *Sometimes* *No*

18. Are there kids you can go to when you need help in school?

Yes *Sometimes* *No*

19. Do you like to paint and draw?*

Yes *Sometimes* *No*

20. Is it hard for you to get along with the kids at school?**

Yes *Sometimes* *No*

21. Are you lonely at school?**

Yes *Sometimes* *No*

22. Do the kids at school like you?

Yes *Sometimes* *No*

23. Do you like playing card games?*

Yes *Sometimes* *No*

24. Do you have friends at school?

Yes *Sometimes* *No*

*Filler items, focusing on hobby or interest items
**Items for which response order was reversed for scoring

Appendix 13. *Loneliness and Social Dissatisfaction Scale (French Version)*

LONELINESS AND SOCIAL DISSATISFACTION SCALE (FRENCH)

1. C'est facile pour moi de me faire de nouveaux (nouvelles) ami(e)s à l'école.

pas très vrai *un peu vrai* *assez vrai* *très vrai*

2. J'aime lire.

pas très vrai *un peu vrai* *assez vrai* *très vrai*

3. Je n'ai personne à qui parler dans la classe.

pas très vrai *un peu vrai* *assez vrai* *très vrai*

4. Je suis bon(ne) pour travailler avec les autres enfants de ma classe.

pas très vrai *un peu vrai* *assez vrai* *très vrai*

5. Je regarde beaucoup la télévision.

pas très vrai *un peu vrai* *assez vrai* *très vrai*

6. C'est difficile pour moi de me faire des ami(e)s à l'école.

pas très vrai *un peu vrai* *assez vrai* *très vrai*

7. J'aime l'école.

pas très vrai *un peu vrai* *assez vrai* *très vrai*

8. J'ai beaucoup d'ami(e)s dans ma classe.

pas très vrai *un peu vrai* *assez vrai* *très vrai*

9. Je me sens seul(e) à l'école.

pas très vrai *un peu vrai* *assez vrai* *très vrai*

10. Je peux trouver un(e) ami(e) dans ma classe quand j'en ai besoin d'un(e).

pas très vrai *un peu vrai* *assez vrai* *très vrai*

11. Je pratique beaucoup les sports.

pas très vrai *un peu vrai* *assez vrai* *très vrai*

12. C'est difficile de trouver dans ma classe des compagnons (compagnes) qui m'aiment.

pas très vrai *un peu vrai* *assez vrai* *très vrai*

13. J'aime les sciences (mathématiques, etc.).

pas très vrai *un peu vrai* *assez vrai* *très vrai*

14. Je n'ai personne avec qui jouer à l'école.

pas très vrai *un peu vrai* *assez vrai* *très vrai*

15. J'aime la musique.

pas très vrai *un peu vrai* *assez vrai* *très vrai*

16. Je m'entends bien avec mes compagnons (compagnes) de classe.

pas très vrai *un peu vrai* *assez vrai* *très vrai*

17. Je me sens mis(e) de côté de ce qui se passe à l'école.

pas très vrai *un peu vrai* *assez vrai* *très vrai*

18. Il n'y a pas d'autres enfants qui je peux aller voir quand j'ai besoin d'aide à l'école.

pas très vrai *un peu vrai* *assez vrai* *très vrai*

19. J'aime peindre et dessiner.

pas très vrai *un peu vrai* *assez vrai* *très vrai*

20. Je ne m'entends pas avec les autres enfants à l'école.

pas très vrai *un peu vrai* *assez vrai* *très vrai*

21. Je suis seul(e) à l'école.

pas très vrai *un peu vrai* *assez vrai* *très vrai*

22. Je suis bien aimé(e) par les compagnons (compagnes) dans ma classe.

pas très vrai *un peu vrai* *assez vrai* *très vrai*

23. J'aime beaucoup jouer à des jeux de société (monopoly, etc.).

pas très vrai *un peu vrai* *assez vrai* *très vrai*

24. Je n'ai pas d'ami(e)s dans ma classe.

pas très vrai *un peu vrai* *assez vrai* *très vrai*

Appendix 14. *Schwartz Peer Victimization Scale (English Version)*

SCHWARTZ PEER VICTIMIZATION SCALE

1. How often do other kids tease or make fun of you?

Never			Almost Everyday
1	2	3	4

2. How often do other kids bully or pick on you?

Never			Almost Everyday
1	2	3	4

3. How often do other kids hit or push you?

Never			Almost Everyday
1	2	3	4

4. How often do other kids gossip or say mean things about you?

Never			Almost Everyday
1	2	3	4

5. How often do other kids hurt your feelings by excluding you?

Never			Almost Everyday
1	2	3	4

6. How often do other children ignore you?

Never			Almost Everyday
1	2	3	4

7. How often do other children say mean things about you online?

Never			Almost Everyday
1	2	3	4

Appendix 15. *Schwartz Peer Victimization Scale (French Version)*

ÉCHELLE DE VICTIMISATION PAR LES PAIRS (SCHWARTZ)

1. Comment souvent les autres enfants se moquent de toi ?

Jamais			À chaque jour
1	2	3	4

2. Comment souvent les autres enfants t'intimide ?

Jamais			À chaque jour
1	2	3	4

3. Comment souvent les autres enfants te frappe ou te pousse ?

Jamais			À chaque jour
1	2	3	4

4. Comment souvent les autres enfants disent des choses méchantes à propos de toi ?

Jamais			À chaque jour
1	2	3	4

5. Comment souvent les autres enfants font du mal à tes sentiments en t'excluant ?

Jamais			À chaque jour
1	2	3	4

6. Comment souvent les autres enfants t'ignorent ?

Jamais			À chaque jour
1	2	3	4

7. Comment souvent les autres enfants disent des choses méchantes à propos de toi en ligne ?

Jamais			À chaque jour
1	2	3	4

Appendix 16. *Revised Child Anxiety and Depression Scale (English Version)*

		Never	Sometimes	Often	Always	Social Phobia	Panic Disorder	Major Depression	Separation Anxiety	Generalized Anxiety	Obsessive-Compulsive
1	I worry about things	0	1	2	3						
2	I feel sad or empty.....	0	1	2	3						
3	When I have a problem, I get a funny feeling in my stomach.....	0	1	2	3						
4	I worry when I think I have done poorly at something.....	0	1	2	3						
5	I would feel afraid of being on my own at home	0	1	2	3						
6	Nothing is much fun anymore.....	0	1	2	3						
7	I feel scared when I have to take a test	0	1	2	3						
8	I feel worried when I think someone is angry with me.....	0	1	2	3						
9	I worry about being away from my parents	0	1	2	3						
10	I get bothered by bad or silly thoughts or pictures in my mind.....	0	1	2	3						
11	I have trouble sleeping.....	0	1	2	3						
12	I worry that I will do badly at my school work	0	1	2	3						
13	I worry that something awful will happen to someone in my family.....	0	1	2	3						
14	I suddenly feel as if I can't breathe when there is no reason for this.....	0	1	2	3						
15	I have problems with my appetite....	0	1	2	3						
16	I have to keep checking that I have done things right (like the switch is off, or the door is locked).....	0	1	2	3						
17	I feel scared if I have to sleep on my own..	0	1	2	3						
18	I have trouble going to school in the mornings because I feel nervous or afraid....	0	1	2	3						
19	I have no energy for things.....	0	1	2	3						
20	I worry I might look foolish.....	0	1	2	3						
21	I am tired a lot.....	0	1	2	3						
22	I worry that bad things will happen to me	0	1	2	3						

		Never	Sometimes	Often	Always	Social Phobia	Panic Disorder	Major Depression	Separation Anxiety	Generalized Anxiety	Obsessive-Compulsive
23	I can't seem to get bad or silly thoughts out of my head.....	0	1	2	3						
24	When I have a problem, my heart beats really fast.....	0	1	2	3						
25	I cannot think clearly.....	0	1	2	3						
26	I suddenly start to tremble or shake when there is no reason for this.....	0	1	2	3						
27	I worry that something bad will happen to me	0	1	2	3						
28	When I have a problem, I feel shaky...	0	1	2	3						
29	I feel worthless.....	0	1	2	3						
30	I worry about making mistakes....	0	1	2	3						
31	I have to think of special thoughts (like numbers or words) to stop bad things from happening	0	1	2	3						
32	I worry what other people think of me...	0	1	2	3						
33	I am afraid of being in crowded places (like shopping centers, the movies, buses, busy playgrounds).....	0	1	2	3						
34	All of a sudden I feel really scared for no reason at all.....	0	1	2	3						
35	I worry about what is going to happen...	0	1	2	3						
36	I suddenly become dizzy or faint when there is no reason for this.....	0	1	2	3						
37	I think about death.....	0	1	2	3						
38	I feel afraid if I have to talk in front of my class	0	1	2	3						
39	My heart suddenly starts to beat too quickly for no reason.....	0	1	2	3						
40	I feel like I don't want to move....	0	1	2	3						
41	I worry that I will suddenly get a scared feeling when there is nothing to be afraid of...	0	1	2	3						
42	I have to do some things over and over again (like washing my hands, cleaning or putting things in a certain order).....	0	1	2	3						
43	I feel afraid that I will make a fool of myself in front of people.....	0	1	2	3						
44	I have to do some things in just the right way to stop bad things from happening....	0	1	2	3						
45	I worry when I go to bed at night....	0	1	2	3						
46	I would feel scared if I had to stay away from home overnight.....	0	1	2	3						
47	I feel restless.....	0	1	2	3						
Please, insert the number of the box you have marked in the box under the letters that is left blank. Then sum up the numbers for each letter's column.		SUMS									

Appendix 17. *Revised Child Anxiety and Depression Scale (French Version)*

Questionnaire RCADS

Consigne : Cochez le mot qui montre avec quelle fréquence chacune de ces choses vous arrivent.
Il n'y a pas de bonnes ou de mauvaises réponses.

	Jamais	Quelque fois	Souvent	Toujours
1. Je m'inquiète sur les choses				
2. Je me sens triste ou vide				
3. Quand j'ai un problème, j'ai une drôle de sensation dans l'estomac				
4. Je m'inquiète quand je pense que j'ai fait quelque chose avec médiocrité				
5. J'aurais peur d'être livré(e) à moi-même à la maison				
6. Rien n'est plus très amusant				
7. Je me sens effrayé(e) quand je dois faire un test				
8. Je me sens inquiet (inquiète) quand je pense que quelqu'un est fâché contre moi				
9. Je m'inquiète à propos d'être loin de mes parents				
10. Je suis tracassé(e) par des pensées ou des images mauvaises ou idiotes dans mon esprit				
11. J'ai du mal à dormir				
12. Je m'inquiète de mal faire mon travail à l'école				
13. Je m'inquiète que quelque chose d'affreux arrive à quelqu'un dans ma famille				
14. Je me sens subitement comme si je ne pouvais plus respirer quand il n'y a aucune raison pour ça				
15. J'ai des problèmes d'appétit				
16. Je dois tout le temps vérifier que j'ai fais les choses correctement (comme vérifier si la lumière est éteinte ou la porte fermée à clé)				
17. Je me sens effrayé(e) si je dois dormir tout(e) seul(e)				
18. J'ai du mal à aller à l'école le matin car je sens nerveux(nerveuse) ou effrayé(e)				
19. Je n'ai aucune énergie pour les choses				
20. Je m'inquiète d'avoir l'air bête				
21. Je suis énormément fatigué(e)				
22. Je m'inquiète que de mauvaises choses m'arrivent				
23. J'ai l'impression de ne pas pouvoir sortir des pensées mauvaises ou idiotes de ma tête				
24. Quand j'ai un problème, mon cœur bat vraiment vite				
25. Je ne peux pas penser clairement				
26. Je me mets subitement à trembler quand il n'y a aucune raison pour ça				
27. Je m'inquiète que quelque chose de mauvais m'arrive				
28. Quand j'ai un problème, je me sens tremblant(e)				
29. Je me sens sans valeur				

30. Je m'inquiète de faire des erreurs				
31. Je dois réfléchir à des pensées spéciales(comme des nombres ou des mots) pour empêcher que de mauvaises choses arrivent				
32. Je m'inquiète de ce que les autres pensent de moi				
33. Je sui effrayé(e) à l'idée d'être dans des endroits pleins de monde (comme les centres commerciaux, les cinémas, les cours d'école bondées)				
34. Tout d'un coup je me sens vraiment très apeuré(e) sans raison				
35. Je m'inquiète à propos de ce qui va se passer				
36. Je deviens subitement pris(e) de vertige ou d'évanouissement quand il n'y a aucune raison pour ça				
37. Je pense à la mort				
38. Je me sens effrayé(e) quand je dois parler face à ma classe				
39. Mon cœur se met subitement à battre trop rapidement pour aucune raison				
40. J'ai l'impression que je ne veux pas bouger				
41. Je m'inquiète d'avoir subitement une sensation effrayante quand il n'y a rien à craindre				
42. Je dois faire certaines choses encore et encore (comme me laver les mains, nettoyer ou mettre les choses dans un certain ordre)				
43. Je me sens effrayé(e) à l'idée d'avoir bête devant les gens				
44. J'ai à faire certaines choses juste comme il faut pour empêcher que de mauvaises choses arrivent				
45. Je m'inquiète quand je vais au lit le soir				
46. Je me sentirais effrayé(e) si je devais rester loin de la maison pour la nuit				
47. Je me sens agité(e)				

Appendix 18. *Test of Gross Motor Development-3*

Test of Gross Motor Development (3rd edition)
TGMD-3 form for collecting norms

Child's Name or ID #:				
Country:	City or Town:		State & Zip Code (if USA):	
Male: ☐	Female: ☐	Disability: Yes ☐ No ☐	If yes, what disability:	Date of Testing:
Child's Date of Birth:			Child's Age in Years and Months:	
Examiner's Name:	Affiliation:		Examiner's email address:	
Estimate of child's family Socioeconomics status: Low ☐ Mod. ☐ High ☐			Child's Race: White ☐ Hispanic ☐ Black ☐ Asian ☐ Mixed ☐	
Child's Residential Location: City ☐ Suburb of City ☐ Rural or Small Town ☐				
Child's Preferred Hand: Right ☐ Left ☐ Not established ☐			Child's preferred foot: Right ☐ Left ☐ Not established ☐	
Child's weight status: Underweight ☐ Normal ☐ Overweight ☐ Very Overweight ☐				

LOCOMOTOR SUBTEST

Skill	Materials	Directions	Performance Criteria	Trial 1	Trial 2	Score
1. Run	60 feet (18.3 m) of clear space to run, 2 cones or markers.	Place 2 cones 50 feet (15.2m) apart. Make sure there is at least 8-10 feet (2.4-3.1m) of space beyond the cone for a safe stopping distance. Tell the child to run fast from one cone to the other cone when you say "GO". Repeat a second trial.	1. Arms move in opposition to legs with elbows bent.			
			2. Brief period where both feet are off the surface.			
			3. Narrow foot placement landing on heel or toes (not flat-footed).			
			4. Non-support leg bent about 90 degrees so foot is close to their buttocks.			
					Skill Score:	
2. Gallop	25 feet (7.6m) of clear space, 2 cones or markers.	Place 2 cones 25 feet apart. Tell the child to gallop from one cone to the other cone and stop. Repeat a second trial.	1. Arms flex and swing forward to produce force.			
			2. A step forward with lead foot followed with the trailing foot landing beside or a little behind the lead foot (not in front of the lead foot).			
			3. Brief period where both feet come off the surface.			
			4. Maintains a rhythmic pattern for 4 consecutive gallops.			
					Skill Score:	

Skill	Materials	Directions	Performance Criteria	Trial 1	Trial 2	Score
3. Hop	A minimum of 15 feet (4.6m) of clear space, 2 cones or markers.	Place 2 cones 15 feet apart. Tell the child to hop 4 times on his/her preferred foot (established before testing). Repeat a second trial.	1. Non-hopping leg swings forward in pendular fashion to produce force.			
			2. Foot of non-hopping leg remains behind hopping leg (does not cross in front of).			
			3. Arms flex and swing forward to produce force.			
			4. Hops 4 consecutive times on the preferred foot before stopping.			
					Skill Score:	
4. Skip	A minimum of 30 feet (9.1m) of clear space, 2 cones or markers.	Place 2 cones 30 feet apart. Mark off two lines at least 30 feet apart with cones/markers. Tell the child to skip from one cone to the other cone. Repeat a second trial.	1. A step forward followed by a hop on the same foot.			
			2. Arms are flexed and move in opposition to legs to produce force.			
			3. Completes 4 continuous rhythmical alternating skips.			
					Skill Score:	
5. Horizontal jump	A minimum of 10 feet (3.1m) of clear space, tape or markers.	Mark off a starting line on the floor, mat, or carpet. Position the child behind the line. Tell the child to jump far. Repeat a second trial.	1. Prior to take off both knees are flexed and arms are extended behind the back.			
			2. Arms extend forcefully forward and upward reaching above the head.			
			3. Both feet come off the floor together and land together.			
			4. Both arms are forced downward during landing.			
					Skill Score:	
6. Slide	A minimum of 25 feet (7.6m) of clear space, a straight line and 2 cones or markers.	Place 2 cones 25 feet apart on a straight line. Tell the child to slide from one cone to the other cone. Let the child decide which direction to slide in first. Ask the child to slide back to the starting point. Repeat a second trial.	1. Body is turned sideways so shoulders remain aligned with the line on the floor.			
			2. A step sideways with the lead foot followed by a slide with the trailing foot where both feet come off the surface briefly.			
			3. 4 continuous slides to the preferred side.			
			4. 4 continuous slides to the non-preferred side.			
					Skill Score:	

Locomotor subtest total score: _____

BALL SKILLS SUBTEST

Skill	Materials	Directions	Performance Criteria	Trial 1	Trial 2	Score
1. Two-hand strike of a stationary ball	4 inch (10.2cm) plastic ball, plastic bat, and a batting tee or other device to hold ball stationary.	Place ball on batting tee at child's waist level. Tell child to hit the ball hard, straight ahead. Point straight ahead. Repeat a second trial.	1. Child's preferred hand grips bat above non-preferred hand.			
			2. Child's non-preferred hip/shoulder faces straight ahead.			
			3. Hip and shoulder rotate and derotate during swing.			
			4. Steps toward ball with non-preferred foot.			
			5. Hits ball sending it straight ahead.			
					Skill Score:	
2. One-hand forehand strike of self-bounced ball	Tennis ball, light plastic paddle, and wall.	Hand the plastic paddle and ball to child. Tell child to hold up ball and drop it (so it bounces about waist height); off the bounce, hit the ball toward the wall. Point toward the wall. Repeat a second trial.	1. Child takes a backswing with the paddle when the ball is bounced.			
			2. Steps toward the ball with non-preferred foot.			
			3. Strikes the ball toward the wall.			
			4. Paddle follows through toward non-preferred shoulder.			
					Skill Score:	
3. One-hand stationary dribble	An 8-10 inch (20.3-25.4cm) playground ball for ages 3-5 years; a basketball for ages 6-10 years; flat surface.	Tell the child to bounce the ball 4 times without moving their feet, using one hand, and then stop by catching the ball. Repeat a second trial.	1. Contacts ball with one hand at about waist level.			
			2. Pushes the ball with fingertips (not slapping at ball).			
			3. Maintains control of the ball for 4 bounces without moving their feet to retrieve the ball.			
					Skill Score:	
4. Two-hand catch	A 4 inch (10.2cm) plastic ball, 15 feet (4.6m) of clear space, tape or marker.	Mark off 2 lines 15 feet apart. The child stands on one line and the tosser stands on the other line. Toss the ball underhand to the child aiming at the child's chest area. Tell the child to catch the ball with 2 hands. Only count a trial where toss is near child's chest. Repeat a second trial.	1. Child's hands are positioned in front of the body with the elbows flexed.			
			2. Arms extend reaching for the ball as it arrives.			
			3. Ball is caught by hands only.			
					Skill Score:	

Skill	Materials	Directions	Performance Criteria	Trial 1	Trial 2	Score
5. Kick a stationary ball	An 8-10 inch ball (20.3-25.4cm); plastic, playground, or soccer ball), tape or marker, a wall, and clear space for kicking.	Mark off 1 line about 20 feet (6.1m) from the wall and a second line 8 feet (2.4m) beyond the first line. Place the ball on the first line closest to the wall. Tell the child to run up and kick the ball hard toward the wall. Repeat a second trial.	1. Rapid, continuous approach to the ball.			
			2. Child takes an elongated stride or leap just prior to ball contact.			
			3. Non-kicking foot placed close to the ball.			
			4. Kicks ball with instep or inside of preferred foot (not the toes).			
					Skill Score:	
6. Overhand throw	A tennis ball, a wall, 20 feet (6.1m) of clear space.	Attach a piece of tape on the floor 20 feet from the wall. Have the child stand behind the tape line facing the wall. Tell the child to throw the ball hard at the wall. Repeat a second trial.	1. Windup is initiated with a downward movement of hand and arm.			
			2. Rotates hip and shoulder to a point where the non-throwing side faces the wall.			
			3. Steps with the foot opposite the throwing hand toward the wall.			
			4. Throwing hand follows through after the ball. Release across the body toward the hip of the non-throwing side.			
					Skill Score:	
7. Underhand throw	A tennis ball, tape, a wall, and 15 feet (4.6m) of space.	Attach a piece of tape 15 feet from the wall. Have the child stand behind the tape line facing the wall. Tell the child to throw the ball underhand and hit the wall. Repeat a second trial.	1. Preferred hand swings down and back reaching behind the trunk.			
			2. Steps forward with the foot opposite the throwing hand.			
			3. Ball is tossed forward hitting the wall without a bounce.			
			4. Hand follows through after ball release to chest level.			
					Skill Score:	

Ball Skills subtest total score: _____

Scoring Notes

- Directions for all test items require you to first give the child a good demonstration of the skill, which includes all of the performance criteria; give the child a practice trial, followed by 2 test trials that you score.
- Score each performance criterion as:
  - 1 = performs correctly
  - 0 = does not perform correctly
- **Performance criteria scores** are calculated by summing the score on trial 1 and trial 2 for each performance criterion.
- **Skill scores** are calculated by summing all of the performance criteria scores for each skill.
- The total **locomotor subtest score** is calculated by summing all 6 locomotor skill scores.
- The total **ball skills subtest score** is calculated by summing the 7 ball skills scores.
- The total **gross motor test score** is calculated by summing the total locomotor subtest score and the total object control subtest score.

- We have learned that test administrator bias occurs when the tester is unsure how to score a performance criterion. When testing a child, if you are unsure of whether the child performed a performance criterion correctly, administer another trial and just look at that performance criterion and score it.
- It is recommended that when testing children with a disability or very young children who appear to be distracted easily, to have them stand on a small poly spot or other marker and tell them to stand on the marker and watch your demonstration. It is also helpful to use another poly spot or marker as the child's starting position for the locomotor skills. Giving these children more structure during your testing should be helpful.